THE

Tea Research Institute

OF

Ceylon

BULLETIN No. 36

Annual Report for the Year 1954

Published by
THE TEA RESEARCH INSTITUTE OF CEYLON
ST. COOMBS, TALAWAKELLE, CEYLON.
1955.

24 NOV 1955

The Tea Research Institute of Ceylon

Staff at December, 31st 1954

Director	...	J. Lamb, O.B.E., M.Sc., (Lond.), F.R.I.C., A.I.C.T.A.
Deputy Director	...	G. B. Portsmouth, B.Sc., (Lond.), A.R.C.S., D.I.C.
Technical Assistant to the Director	...	J. V. Harbord, M.A., (Cantab.), A.I.C.T.A.
Chemistry		
Biochemist	...	J. Lamb, O.B.E., M.Sc., (Lond.), F.R.I.C., A.I.C.T.A.
Agricultural Chemist	...	J. A. H. Tolhurst, B.Sc., (Reading)
Research Assistant to the Biochemist	...	M. S. Ramaswamy, B.Sc., (Mysore), A.R.I.C., A.I.I.Sc.
Assistants	...	E. N. Perera and V. Mendis
Technology		
Technologist	...	E. L. Keegel
Assistant	...	S. M. Gunaratnam
Plant Physiology		
Plant Physiologist	...	G. B. Portsmouth, B.Sc., (Lond.), A.R.C.S., D.I.C.
Research Assistant	...	F. H. Kehl
Assistants	...	M. Piyasena, L. M. de W. Tillekeratne, B.Sc., (Cey.), D. D. Kroon, D. H. de Saram, H. B. Ratnayake and J. I. H. Bandaranayake
Pathology		
Pathologist	...	C. A. Loos, F.L.S., M.I.Biol.
Mycologist	...	B. N. Webster, M.A., (Cantab.), M.Sc., (Nottm.), M.I.Biol.
Entomologist	...	B. A. Baptist, B.Sc., (Lond.), Ph.D., (Cantab.).
Assistant Pathologist	...	G. D. Austin
Assistants	...	D. J. W. Ranaweera, M. K. Vythilingam, J. V. Sabanayagam and S. Murugiah.
Engineering	...	
Maintenance Engineer		D. V. W. Perera, A.M.I.B.E.
Works Clerk	...	R. A. Daniel
Electrician	...	W. R. Solomon
Mechanics	...	D. A. S. Opatha and K. S. Vadivelu
St. Coombs Estate		
Superintendent	...	E. S. Rose
Tea Maker	...	A. T. Fernando
Dispenser	...	S. P. de Silva
Office Assistants	...	P. E. de Silva and G. L. A. Thomas
Low-Country Sub-Station		
Scientific Officer	...	T. E. Walter, B.Sc., (Edin.)
Assistant	...	F. P. Jayawardena
Administration		
Secretary	...	G. A. D. Kehl
Secretary to the Director		A. C. Perera
Assistant Secretary/ Librarian	...	G. Mason, B.A., (Lond.)
Accounts Clerk	...	A. H. B. Dias
Office Assistants	...	F. G. de Sielvie, D. C. W. T. Amarasingha, K. A. Salaam, F. N. C. de Silva, R. I. Pereira, and W. P. Chandrasekera.

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TWENTY-NINTH ANNUAL REPORT OF THE BOARD OF THE TEA RESEARCH INSTITUTE OF CEYLON FOR THE YEAR 1954

Foundation.—The Tea Research Institute of Ceylon was established by Ordinance No. 12 of 1925 dated 27th October, 1925.

The personnel constituting the Board of Control is laid down in the above Ordinance, the Tea Research (Amendment) Act No. 24 of 1948 dated 20th December, 1948, and the Tea Research (Amendment) Act No. 51 of 1953, dated 19th December, 1953.

The members of the Board on the first day of January, 1954, were:—

Ex-Officio Members

The Director of Agriculture (Dr. A. W. R. Joachim, O.B.E.)

The Hon'ble the Minister of Finance (represented by Sir Arthur Ranasinha, C.M.G., C.B.E., C.C.S., Secretary to the Treasury).

The Chairman, Planters' Association of Ceylon (Mr. W. R. Vander Kiste).

The Chairman, Agency Section, Planters' Association of Ceylon (Mr. C. D. Green).

The Tea Controller (Mr. B. Mahadeva, C.C.S.).

Representatives of the Planters' Association of Ceylon

Mr. R. C. Scott, C.B.E.
Mr. H. S. Hurst.
Mr. A. J. Dickson.

Representatives of the Planters' Association of Ceylon, Agency Section

Mr. W. H. Attfield.
Mr. G. K. Newton.
Mr. A. D. McLeod.

Representatives of the Low-Country Products Association

Mr. W. Neal de Alwis, M.P.
Mr. Errol Jayawickreme, J.P., U.M.
Mr. D. E. Hettiarachchi, J.P., U.M.

Representative of the Small Holders

Mr. V. G. W. Ratnayaka, M.B.E., M.P.

Chairman:	Mr. R. C. Scott, C.B.E.
Secretary:	Mr. J. Lamb, O.B.E.
Solicitors:	Messrs. Julius & Creasy.
Auditors:	Messrs. Ford, Rhodes, Thornton & Co.
Registered Office:	St. Coombs, Talawakelle.

The following changes in the personnel of the Board were recorded during the year:—

Ex-Officio Members.—Mr. D. F. Ewen, C.B.E., Chairman, Planters' Association of Ceylon, Agency Section, vice Mr. C. D. Green as from 10th March.

Mr. Kenneth Morford, C.B.E., Chairman, Planters' Association of Ceylon, vice Mr. W. R. Vander Kiste as from 27th March.

Mr. D. C. L. Amarasinghe, C.C.S., Tea Controller, vice Mr. B. Mahadeva, C.C.S. as from 29th April.

Mr. W. D. Gunaratne, O.B.E., C.C.S., Controller of Finance, General Treasury, vice Sir Arthur Ranasinha, C.M.G., C.B.E., C.C.S. as from 20th December.

Representatives of the Planters' Association of Ceylon.—Mr. N. B. Parker, vice Mr. A. J. Dickson as from 8th December.

Representatives of the Planters' Association of Ceylon, Agency Section.—Mr. C. D. Green vice Mr. W. H. Attfield as from 10th March.

Mr. A. D. McLeod was re-nominated as from 7th May.

Mr. R. M. Macintyre acted for Mr. G. K. Newton (on leave) from 5th May to 15th November.

Mr. W. H. Gourlay acted for Mr. A. D. McLeod (on leave) from 1st August.

Representatives of the Low-Country Products Association.—Mr. J. L. D. Peiris vice Mr. W. Neal de Alwis, M.P. as from 6th March.

Mr. B. Amarasuriya vice Mr. Errol Jayawickreme as from 6th March.

Mr. F. Amarasuriya vice Mr. D. E. Hettiarachchi, J.P., U.M. as from 19th November.

Four meetings of the Board were held during the year, on 19th February, 21st May, 1st October and 10th December.

Chairman.—Mr. R. C. Scott, C.B.E. resigned the Chairmanship of the Board on 10th December, on which date the Board paid a tribute to Mr. Scott's long and valuable services to the Institute in his capacity as Chairman since 22nd December, 1944.

On Mr. Scott's proposal Mr. H. S. Hurst was unanimously elected to succeed him as Chairman.

Committees.—*Finance Sub-Committee:* The Chairman, T.R.I. (Mr. R. C. Scott, C.B.E.), the Chairman, Planters' Association of Ceylon (Mr. W. R. Vander Kiste), the Chairman, Planters' Association of Ceylon, Agency Section, (Mr. C. D. Green), Messrs. A. D. McLeod, H. S. Hurst, Dr. A. W. R. Joachim, O.B.E., and the Director and Secretary (Mr. J. Lamb, O.B.E.).

The following changes in the membership of the Committee were recorded during the year:—

Mr. D. F. Ewen, C.B.E., Chairman, Planters' Association of Ceylon, Agency Section, vice Mr. C. D. Green as from 10th March.

Mr. Kenneth Morford, C.B.E., Chairman, Planters' Association of Ceylon vice Mr. W. R. Vander Kiste as from 27th March.

Sir Arthur Ranasinha, C.M.G., C.B.E., C.C.S. vice Dr. A. W. R. Joachim (resigned) as from 21st May.

Mr. R. M. Macintyre, and later Mr. W. H. Gourlay, for Mr. A. D. McLeod as from 1st October.

Two meetings of the Committee were held during the year on 1st October, and 9th December.

Special Sub-Committee of the Board.—Mr. R. C. Scott, C.B.E. (Chairman), Dr. A. W. R. Joachim, O.B.E., Messrs. G. K. Newton, Errol Jayawickreme, C. D. Green, and J. Lamb, O.B.E.

By a resolution of the Board the name of this Committee was changed to that of "Standing Committee" as from 21st May.

Changes in the personnel of the Committee recorded during the year were:—

Mr. D. E. Hettiarachchi, J.P., U.M. vice Mr. Errol Jayawickreme, J.P., U.M. as from 21st May.

Mr. D. F. Ewen, C.B.E. (Chairman, Planters' Association of Ceylon, Agency Section), vice Mr. C. D. Green as from 21st May.

Mr. F. Amarasuriya vice Mr. D. E. Hettiarachchi, J.P., U.M., as from 10th December.

Meetings of the Committee were held on 18th/19th January, 18th June and 4th November.

Experimental and Estate Committee.—Chairman, The Director, T.R.I. (Mr. J. Lamb, O.B.E.), Mr. R. C. Scott, C.B.E., (Chairman, T.R.I.), Mr. G. K. Newton, (Visiting Agent, St. Coombs Estate), Mr. E. S. Rose, (Superintendent, St. Coombs Estate), Messrs. S. Bolster, H. S. Hurst, A. J. Pelly Fry (Acting for Mr. T. Kane), S. P. Vytilingam, M.P., A. S. Hudson (Acting for Mr. R. Leaning), A. J. Dickson, D. E. Hettiarachchi, J.P., U.M., A. Watt (Acting for Mr. R. J. S. Bean), Senior Staff, T.R.I.—Mr. B. N. Webster (Mycologist) acted as Convener.

Changes in the personnel of the Committee during the year were:—

Mr. T. Kane vice Mr. A. J. Pelly Fry as from 29th January.

Mr. R. Leaning resigned as from 17th March.

Mr. R. J. S. Bean vice Mr. A. Watt as from 20th April.

Messrs. S. Bolster and A. J. Dickson resigned as from 16th October.

Four meetings of the Committee were held on 20th March, 19th June, 16th October, and 20th November.

Low-Country Sub-Station Sub-Committee.—Messrs. R. C. Scott, C.B.E., (Chairman, T.R.I.), V. G. W. Ratnayaka, M.B.E., M.P., W. Neal de Alwis, M.P., Dr. A. W. R. Joachim, O.B.E., and Mr. J. Lamb, O.B.E. (Director, T.R.I.).

The Committee was reconstituted by the Board on 1st October; Messrs. J. L. D. Peiris, D. E. Hettiarachchi, J.P., U.M., and the Director, T.R.I. (Mr. J. Lamb, O.B.E.) were elected to form the Committee with Mr. R. J. S. Bean as a co-opted member.

A meeting of the Committee was held on 18th October.

Small Holdings Sub-Committee.—Mr. V. G. W. Ratnayaka, M.B.E., M.P., (Chairman), Dr. A. W. R. Joachim, O.B.E. (Director of Agriculture), Mr. W. Neal de Alwis, M.P., Mr. J. Lamb, O.B.E. (Director T.R.I.), Mr. R. L. Illankoon, (O.I.C., Small Holdings Advisory Service) Convener.

Changes in the personnel of the Committee during the year were:—

Mr. D. C. L. Amarasinghe (Tea Controller) vice Dr. A. W. R. Joachim, O.B.E. (resigned) as from 29th April.

Mr. D. E. Hettiarachchi, J.P., U.M. vice Mr. W. Neal de Alwis, M.P. as from 21st May.

Mr. F. Amarasuriya vice Mr. D. E. Hettiarachchi, J.P., U.M. as from 10th December.

The Committee held two meetings on 18th February and 1st October.

Appointments Sub-Committee.—The Chairman of the Board (Mr. R. C. Scott, C.B.E.), The Director of Agriculture (Dr. A. W. R. Joachim, O.B.E.), The Director, T.R.I., (Mr. J. Lamb, O.B.E.), The Vice Chancellor of the University of Ceylon (Sir Ivor Jennings, Q.C.) or his nominee, and a further member of the Board nominated by the Chairman.

Trustees—T.R.I. Junior Staff Provident Fund.—The Chairman, T.R.I. (Mr. R. C. Scott, C.B.E.), The Director, T.R.I. (Mr. J. Lamb, O.B.E.), Mr. V. G. W. Ratnayaka, M.B.E., M.P. representing the Board of the T.R.I., Mr. E. N. Perera representing the Junior Staff, and Mr. A. D. McLeod.

A meeting of the Trustees was held on 17th June.

Committee of Management, Junior Staff Medical Fund.—The Chairman, T.R.I., (Mr. R. C. Scott, C.B.E.), The Director, T.R.I. (Mr. J. Lamb, O.B.E.), and Mr. G. D. Austin, representing the Junior Staff.

A meeting of the Committee was held on 17th June.

Visiting Agent.—Mr. G. K. Newton continued to act as the Visiting Agent for St. Coombs Estate. He paid two visits during the year on 8th February, and 18th/19th November.

Director and Secretary.—At the meeting of the Board held on 10th December, Mr. J. Lamb, O.B.E. announced his impending resignation and departure from Ceylon to take up an appointment in West Africa. The Board at the same meeting expressed deep appreciation of the very valuable services Mr. Lamb had rendered to the Institute during the 20 years he was on the staff.

Finance.—The income for the year which amounted to Rs. 2,387,821, showed a marked increase over that for 1953. Cess collections, which on the new rate totalled Rs. 2,001,417, recorded an increase of Rs. 994,408 over that for the previous year, and together with the profit of Rs. 375,378 from St. Coombs Estate accounted for the increase in the total income for the year as compared with 1953. There was hardly any appreciable difference in the income derived from the other sources.

Revenue expenditure, excluding depreciation, on the other hand, showed an increase of only Rs. 199,192 over that for 1953. Increases in the items Personal Emoluments of the Scientific Staff of Rs. 76,244, General Services of Rs. 44,159, and Small Holdings Advisory Service of Rs. 37,166 were the most noteworthy.

Capital expenditure for the year amounted to Rs. 314,074.

Net Liquid Assets as at 31st December, after allowing for liabilities on Furlough Pay and Passages (Rs. 129,163), and Small Holdings Advisory Service (Rs. 75,425), amounted to Rs. 1,405,587 against a total Depreciation Reserve of Rs. 1,030,579.

The funds available, together with those which may be built up in the next few years, have already been earmarked for an extensive development programme.

Small Holdings Advisory Service.—The income for the year consisted chiefly of the Institute's grant of Rs. 250,000, and totalled Rs. 258,090 as compared with Rs. 218,292 in 1953. Expenditure, excluding Depreciation on Revenue Account, amounted to Rs. 155,253. Expenditure on Capital Account amounted to Rs. 310. The total value of Liquid Assets to the credit of the Service as at 31st December was Rs. 277,920.

St. Coombs Estate.—The year 1954 has been a most successful one for the estate. The crop harvested, 287,202 lbs, the yield per acre, 1,043 lbs. and the profit on Working Account, Rs. 375,378, were the highest ever recorded. The net sale average for St. Coombs teas for 1954 was Rs. 2.89 as compared with Rs. 2.01 for the previous year.

Publications.—Four parts of the *Tea Quarterly*, Volume XXV, and Bulletin No. 35, Annual Report for the year 1953, were published during the year.

Receipts from subscriptions and sundry sales amounted to Rs. 4,804, and from advertisements Rs. 5,680. The total cost of printing and distribution was Rs. 18,303, making a net loss on this account of Rs. 7,819.

Acknowledgments.—As in the past the Institute continued to receive the fullest co-operation from the Ceylon Association in London, The Planters' Association of Ceylon, The Agency Section of the Planters' Association of Ceylon, Agency Houses, Engineering Firms and other bodies concerned with the tea industry in Ceylon; to all of whom the Board is deeply grateful.

Particular mention must be made of the Planters' Association of Ceylon for having placed their meeting room at the disposal of the Board for meetings of the Board and its various Committees.

Accounts.—Messrs. Ford, Rhodes, Thornton & Company continued to act as auditors to the Institute. The audited Statement of Accounts and the Balance Sheet for the year ended 31st December, 1954, are appended to this report together with the report of the Director as well as those of the Scientific Staff, the Maintenance Engineer and the Superintendent, St. Coombs Estate.

G. B. PORTSMOUTH,
Acting Secretary.

Tea Research Institute of Ceylon,
St. Coombs,
Talawakelle.
17th July, 1955.

THE TEA RESEARCH INSTITUTE OF CEYLON.

BALANCE SHEET AS AT 31st DECEMBER, 1954.

1953 Rs.			Rs. Cts.	Rs. Cts.	Rs. Cts.	1953 Rs.			Rs. Cts.	Rs. Cts.	Rs. Cts.
		CREDITORS AND PROVISIONS:—						**FIXED ASSETS:—**			
		Creditors					3,075,382	Cost		3,293,382.44	
	49,135	Sundry creditors—estate	65,282.38				219,670	Additions in 1954		314,073.86	
	25,762	—do —research	42,886.45								
		Subscriptions for publications					3,295,052			3,607,456.30	
	384	(received in advance)	345.70			3,293,383	1,669	*Less:* Scrapped and sold in 1954 ...		10,410.00	3,597,046.30
		Contributions to cart road									
	451	(received in advance)	451.00								
80,254	4,522	Building contractor	12,332.90	121,298.43							
							20,000	**INVESTMENTS AT COST:—**			
							29,512	Rs. 20,000/- 3½% Ceylon Govt. National Loan 1956		20,000.00	
		PROVISION FOR FURLOUGH PAY AND PASSAGES:—						Rs. 30,000/- 3½% —do— Loan 1957/62		29,512.50	
	64,345	As at 31st December, 1953	77,488.43				—	Rs. 75,000/- 3½% —do— National Loan		72,562.50	
	60,137	Additions during 1954	60,830.00				15,000	Rs. 100,000/- 3¼% —do— —do 1964		100,000.00	
							32,435	Rs. 15,000/- 3 % —do— Loan 1973/78		15,000.00	
	124,482		138,318.43				29,928	£2,300/- 3½% War Loan		32,434.76	
77,488	46,994	*Less:* Payments 1954	9,155.36	129,163.07			90,000	£2,063-18-1 4% Funding Loan 1960/90 ...		29,928.06	
								£6,750/- 2½% National War Bonds 1952/54		— —	
						216,875		(Approximate market value Rs. 296,000/-)			299,437.82
		SMALL HOLDINGS ADVISORY SERVICE:—						**CURRENT ASSETS:—**			
	70,232	Balance as at 31st December, 1953 ...	78,634.78					Debtors—general			
	167,835	Appropriations from Tea Cess Account 1953	— —				83,656	Principal Collector of Customs ...	137,191.64		
	45,000	Special Contribution by Tea Research Institute of Ceylon 1954	250,000.00				1,350	Advertising receipts	2,177.50		
	—	Treasury Bill proceeds	50,000.00				250	Lindoola road upkeep contribution 1953 ...	— —		
	—	Interest credited on monthly balances ...	1,898.51				2,001	St. Coombs Co-operative Stores Society, Ltd.	— —		
	—	Interest on investments	2,237.37			90,535	3,278	Sundries	3,838.93	143,208.07	
	—	Refund on telephones received from Postal Department	152.00								
	283,067		382,922.66				3,149	Debtors—research			
78,635	204,432	*Less:* Remittances and disbursements 1954 ...	307,496.98	75,425.68	325,887.18		10,775	Ceylon Association in London—£354-18-2 ...	4,732.11		
								Research staff	9,216.73		
236,377		Carried forward			325,887.18	3,600,793	13,924	Carried forward	13,948.84	143,208.07	3,896,484.12

THE TEA RESEARCH INSTITUTE OF CEYLON.

BALANCE SHEET AS AT 31st DECEMBER, 1954.—*contd.*

1953 Rs.			Rs. Cts.	Rs. Cts.	Rs. Cts.	1953 Rs.			Rs. Cts	Rs. Cts.	Rs. Cts.
236,377		Brought forward			325,887.18	3,600,793	13,924	Brought forward	13,948.84	143,208.07	3,896,484.12
		BLISTER BLIGHT ACCOUNT:—					1,630	Accrued interest on investments ...	4,269.84		
							7,186	Sundries—estate	2,045.06		
		Contribution received from Tea Controller to 31st December, 1953		600,000.00			2,631	Debt Settlement Account	87.65		
	600,000	*Less:* Capital Account to 31st December, 1953	157,086.47					Ceylon Planters' Provident Society Advance Account	666.94		
		Transferred to Tea Research Institute of Ceylon Capital Account	97,294.36			25,371	—	Kerosene cookers—staff	7,891.11	28,909.44	
		Transferred to Blister Blight Revenue Account ...	59,792.11	157,086.47	—			Stocks			
	—						19,792	General	18,839.26		
							5,585	Electrical	4,563.14		
		Revenue Account to 31st December, 1954 ...	347,904.87				92,173	Tea (30,066 lb.) at prices since realised ...	102,980.07		
		Transferred to Blister Blight Capital Account ...	59,792.11	407,696.98				Estate			
	484,735						583	Foodstuffs 243.01			
							3,364	Packing materials ... 3,274.29			
115,265	—	Balance transferred to Surplus Account ...		192,303.02	600,000.00	— —	121,500	3 Postage stamps 9.59	3,526.89	129,909.36	
		DEPRECIATION PROVISION:—						Cash			
	868,196	As at 31st December, 1953			943,460.77		—	On fixed deposit	890,000.00		
	75,265	Additions during 1954			94,913.82			On current account with National Bank of			
							131,917	India, Ltd.	231,354.07		
	943,461				1,038,374.59		955	Petty cash	581.79		
943,461	—	*Less:* Depreciation on items sold ...			7,795.00	1,030,579.59	21	Postage stamps	13.49		
							231	Postal franker account	247.17		
							133,124	Carried forward	1,122,196.52		
1,295,103		Carried forward			Rs.	1,356,466.77	3,747,664	Carried forward		302,026.87	3,896,484.12

THE TEA RESEARCH INSTITUTE OF CEYLON

BALANCE SHEET AS AT 31st DECEMBER, 1954,—*(contd.)*

1953 Rs.			Rs. Cts.	Rs. Cts.	Rs. Cts.	1953 Rs.			Rs. Cts.	Rs. Cts.	Rs. Cts.
1,295,103		Brought forward			1,356,466.77	3,747,664		Brought forward		302,026.87	3,896,484.12
		SURPLUS ACCOUNT:—						CURRENT ASSETS:—*(continued)*			
	2,449,655	Balance as at 31st December, 1953 ...		2,594,811.16				Cash—*(continued)*			
		Add: Balance from Blister Blight Account transferred	192,303.02				133,124	Brought forward	1,122,196.52		
2,594,811	145,156	Excess of income over expenditure—1954 ...	1,184,939.67	1,377,242.69	3,972,053.85			Estate			
							8,926	Cash at bank	6,411.48		
							175	In hand	676.63		
							28	Passara Sub-Station in hand ...	25.00		
						142,250	—	Low Country Sub-Station in hand	700.00	7,813.11	1,130,009.63	1,432,036.50
3,889,914				Rs. 5,328,520.62	3,889,914						Rs. 5,328,520.62

We have examined the above balance sheet with the books of the Tea Research Institute of Ceylon and St. Coombs Estate and have obtained all the information and explanations we have required. Revenue expenditure on blister blight account has been charged to expense account on the instructions of the director. Subject to this remark, in our opinion the foregoing balance sheet is properly drawn up so as to exhibit a true and correct view of the financial affairs of the Institute as at 31st December, 1954, according to the best of our information and the explanations given to us and as shown by the books.

Colombo, 10th June, 1955.

(Signed) FORD, RHODES, THORNTON & Co.,
Chartered Accountants.

THE TEA RESEARCH INSTITUTE OF CEYLON.

CAPITAL EXPENDITURE ACCOUNT AS AT 31st DECEMBER, 1954

	As at 31-12-53	Additions in 1954	Items scrapped and sold	As at 31-12 54
	Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.
Land including development ...	1,030,045.23	35,945.29	—	1,065,990.52
Library shelving ...	1,093.37	—	—	1,093.37
Buildings and lines ...	1,610,022.15	126,157.34	—	1,736,179.49
Furniture and equipment ...	252,433.45	8,317.18	366.50	260,384.13
Laboratory equipment ...	76,284.78	13,099.67	48.50	89,335.95
Experimental machinery ...	43,970.10	24,943.92	—	68,914.02
Motor road roller ...	7,386.03	—	—	7,386.03
Motor car ...	9,995.00	12,407.50	9,995.00	12,407.50
Machinery-estate ...	156,492.47	—	—	156,492.47
Hoist ...	2,055.38	—	—	2,055.38
Station wagon ...	11,500.00	—	—	11,500.00
Lawn mowers ...	650.00	117.78	—	767.78
Low-country sub-station ...	83,536.04	283.00	—	83,819.04
Grubber ...	2,534.77	—	—	2,534.77
Trailer capital ...	3,640.92	—	—	3,640.92
Covered leaf trailer ...	1,742.75	—	—	1,742.75
Workshop machinery ...		25,006.67	—	25,006.67
Workshop vehicles ...		22,344.26	—	22,344.26
Workshop equipment ...		12,022.27	—	12,022.27
Dusters, sprayers and pumps ...	—	20,923.68	—	20,923.68
Workshop furniture ...	—	1,796.75	—	1,796.75
Leaf elevator ...	—	10,708.55	—	10,708.55
	Rs. 3,293,382.44	Rs. 314,073.86	Rs. 10,410.00	Rs. 3,597,046.30

THE TEA RESEARCH INSTITUTE OF CEYLON.

ESTATE WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1954.

1953 Rs.	Estate Expenditure—Revenue	Rs. Cts.	Rs. Cts.	1953 Rs.	Tea Sales Gross Proceeds:—	lb.	Rs. Cts.	Rs. Cts.
104,811	General charges	98,362.40						
104,273	Upkeep	77,362.28		554,448	Colombo	276,388	809,486.38	
45,637	Cultivation	50,510.53		1,794	Local	1,372	2,887.09	
106,035	Harvesting	109,464.30		4,237	Broken mixed	7,242	4,204.20	
84,540	Manufacture	94,272.58	429,972.09	600	Biochemical department	325	481.00	
—	Bonus to staff		14,236.00	—	Gratis	1,875	— —	
8,210	Colombo brokerage and handling charges		10,948.87			287,202		817,058.67
1,024	Motor road roller Working Account		— —					
—	Motor cycle		827.71	7,216	Profit on sale of Guatemala grass and clonal plants			14,304.44
113,765	Balance to Income and Expenditure Account		375,378.44					
568,295		Rs.	831,363.11	568,295			Rs.	831,363.11

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1954.

1953 Rs.		Rs. Cts.	1953 Rs.		Rs. Cts.
79,395	Administration of the Board	89,310.12	113,765	Balance from Estate Working Account	375,378.44
154,792	Personal emoluments of scientific staff	231,036.05	1,007,008	Tea cess	2,001,416.71
112,806	Emoluments—junior and sub-scientific staff	120,537.84	6,921	Interest	8,809.86
23,367	Laboratory	21,743.28	600	Rent of caddy	1,800.00
5,332	Library and publications	14,254.80	53	Guest house Account	277.00
212,834	Small Holdings Advisory Service	250,000.00	849	Miscellaneous receipts	139.30
44,357	Field and factory experiments	49,692.47			
27,152	Travelling of staff	35,462.33			
22,368	Maintenance of buildings	33,419.44			
72,819	General services	116,978.17			
125,224	Miscellaneous	135,261.41			
8,433	Low-Country sub-station	10,271.91			
2,943	Government of Ceylon—Interest on loan	— —			
16,953	Factory	— —			
75,265	Depreciation	94,913.82			
145,156	Balance, being excess of income over revenue expenditure for the year ended 31st December, 1954	1,184,939.67			
1,129,196		Rs. 2,387,821.31	1,129,196		Rs. 2,387,821.31

REPORT ON ST. COOMBS ESTATE FOR THE YEAR 1954

Staff.—A learner Teamaker was taken on from 1st June, 1954, to assist the Teamaker. Mr. J. D. Celestine—Dispenser—left the estate on 30th November, 1954, and a qualified Government Apothecary, Mr. Shirley P. de Silva assumed duties as Estate Dispenser. All other staff appointments remain the same.

Acreage.

	A	R	P
Tea in bearing ...	275	1	00
New clearing ...	16	1	28
Green manure clearing ...	12	0	00
Land fit to open in tea ...	5	3	00
Buildings and gardens ...	45	2	11
Fuel clearings ...	36	3	14
Waste land and ravines ...	32	0	24
	423	3	37

Acreage statement has been altered slightly from 1953 by the inclusion of 2 acres of No. 10 new clearing brought into bearing during the year.

Weather.—(Estate gauge).

	Rainfall Inches	*Wet Days*	*Sunshine Hours*
Registered in 1954 ...	83.56	249	1510
Registered in 1953 ...	75.74	199	1948
Average (Decennial 1945-1954) ...	88.87	228	1868

Rainfall for the year was fairly evenly distributed, August showing the highest rainfall for a month with 14.34" recorded by the estate gauge. Rainfall in December was unusual, being the highest recorded since 1946. Conditions generally were good for crop intake but deteriorated during the last quarter.

Sunshine hours show considerable falling off on previous years.

Crop.

	1954 lb.	1953 lb.
Estimate ...	260,000	260,000
Total crop (including Broken Mixed) ...	287,202	277,183
Yield per acre on 275¼ acres ...	1,043	—
Yield per acre on 273¼ acres ...	—	1,014

Crop shows a further increase over previous years, resulting mainly from the continuation of a high standard of plucking and adequate and efficient manuring. The percentage of made tea to green leaf was maintained following the high standard of leaf brought into the factory. The highest yielding field gave 1,553 lbs. per acre between 16 and 28 months from pruning.

Prices and Total Crop Sold.

Year	*Total crop sold lb.*	*Total price cents*	*Nett price cents*
1954	276,388	292.88	288.91
1953	275,397	203.73	200.76

Prices realised conformed with the high prices generally throughout the tea market and St. Coombs compared very favourably with district estates of similar elevation. The improvement in teas manufactured was maintained. Profit for the year was an all time record.

Cost of Production.

	1954 *Cost per lb. cents*	1953 *Cost per lb. cents*
Estimate ...	166.59	170.06
Actual ...	149.08	160.65

Profit on Estate Working.

1954	... Rs.	375,378.44
1953	... Rs.	113,764.57

Capital Expenditure.

1954	... Rs.	69,151.42	24.08 cts. per lb.
1953	... Rs.	37,970.31	13.70 cts. per lb.

The expenditure here was:—

Internal cart road	...	Rs.	1,582.72
Buildings	...	„	17,716.29
New clearings	...	„	33,548.79
Factory	...	„	3,782.17
Leaf elevator	...	„	10,708.55
Tractor account	...	„	1,812.90

Plucking.—The standard of plucking was generally maintained throughout the year, with a slight falling off during the rush months of April/May which was soon corrected. Rounds continued at 7 to 8 days. All the new fields, *i.e.* fields up to 2 years from pruning, were plucked on the individual row system, which appears to be working most satisfactorily. Unfortunately this system cannot be extended to the old fields due to the fact that it is from these pluckers that the T.R.I. plucking labour requirements are drawn and these vary from day to day.

Estate Roads and Paths.—General upkeep and improvement were carried on throughout the year.

Fuel Clearings.—The shortage of firewood became acute in the early part of the year, due to the fact that no fuel clearings were available of sufficient age to cut. An effort has been and is being made to improve the situation for future years by planting up as many ravines and patna areas as possible with fuel trees, but this policy is of course a long term one.

Ravines and Boundaries.—Routine clearing of ravines and boundaries continued throughout the year, but the estate appears to have very many long and narrow grass ravines which could easily be cleaned and planted in tea. Special attention will be paid to this during 1955.

Pests and Diseases.—Despite south-west monsoon conditions which were extremely favourable for blister blight, excellent control was obtained over the whole estate using the equipment purchased in 1953. A reduction in application cost per acre was maintained by using double boom-jet nozzles and thereby covering more rows per sprayer at one time, thus increasing the acres per sprayer per day.

Loranthus creeper was again evident in most fields, in particular in the fields around the laboratory block, and was satisfactorily removed.

Poria caused some concern by its frequent re-appearance in old treated areas and it has been decided therefore to train a special gang who will work through the whole estate, surveying each field in turn for Poria infection, and who will burn surface trash and root growth on the site.

Mite attacks have caused considerable concern and all fields were affected, some areas so badly that serious defoliation occurred and there must have been some loss of crop.

Supplying and Nurseries.—During the year all balance V.P. plants, not required for the new clearings, were put out in the fields pruned during the year, but only in areas which had been fallow under a bush green manure for some while and which were big enough to be worthwhile supplying. Isolated vacancies are still evident but the existing bushes are large enough to fill the gap without re-supplying with young plants.

Mossing and Ferning.—With the exception of a few acres ferned by estate daily labour, all ferns were removed subsequent to pruning by the estate weeding contractors. All pruned fields were effectively lime sprayed to control the growth of moss.

Manuring.—The system of applying manure and forking both rows continued, using the T.R.I. 488 mixture and applying it two or three times a year, according to the crop intake of each individual field, 500 lbs. per acre being set as a limit. Manure was applied at either 6 monthly intervals or when this crop had been achieved, whichever was the earlier.

The following are details of nitrogen and potash applied to individual fields as T.R.I. 488 mixture:—

Field No.	Month manured	1952 Nit.	1952 Pot.	Month manured	1953 Nit.	1953 Pot.	Month manured	1954 Nit.	1954 Pot.
1	May	55	32	June	59	28			
	Dec.	36	21	Dec.	53	25	July	46	22
2	Jan.	50	28	June	53	25	Sept.	43	20
	May	69	40	Dec.	43	20	Dec.	36	17
	Nov.	53	30						
3	May	60	35	June	53	25	Sept.	53	25
	Nov.	40	23	Dec.	43	20	Dec.	36	17
4	April	43	24	July	66	31	Jan.	53	25
	Nov.	46	26				Aug.	56	26
5	April	56	32	Nov.	56	26	June	59	28
	Nov.	43	25				Dec.	43	20
6	Jan.	50	28	Feb.	56	26	April	63	30
	June	58	33	Sept.	59	28	Oct.	43	20
7	April	63	36	March	40	19	July	53	25
	Sept.	43	25	Dec.	43	20	Dec.	43	20
8	April	69	40	March	43	20	June	66	31
	Sept.	54.5	31	Oct.	53	25	Nov.	53	25
9	June	69	40	Feb.	46	22	April	66	31
				Sept.	63	30	Oct.	46	22
10	June	69	40	Jan.	46	22	March	73	34
				Sept.	69	32	Aug.	59	28
11	Jan.	50	28	Feb.	63	30	April	69	32
	June	58	33	Sept.	69	32	Dec.	53	25
12	Jan.	56	32	March	56	26	May	43	20
	July	49	27	Oct.	56	26	Nov.	53	25
13	Feb.	53	30	March	28	15	May	69	32
	Aug.	60	35	Oct.	40	19	Nov.	59	28
14A	June	69	40	July	66	31	Jan.	63	30
	Dec.	56	32				June	56	26
14B	June	46	26	July	73	34	Jan.	53	25
	Dec.	53	30				June	66	31

Green Manure and Shade Trees.—Grevillea, *Albizzia sumatrana* and *Albizzia moluccana* or dadaps are being planted according to the long term shade tree programme in all the fields pruned during the monsoon in 1954, but those fields pruned into the dry weather will not be supplied until the wet season of 1955.

The areas planted with Guatemala grass in No. 3 field (see Annual Report for 1953) show no indication of either great soil improvement or change in tea bush condition, but there is no doubt that Guatemala grass planted in the tea rows does interfere with the plucking and tends to overshade the bushes unless it is kept under close control.

Stylosanthes gracilis, which was planted on the road banks, has come away with varying success but, where established, is spreading in a most satisfactory manner.

Pruning.—The light type of prune on the slope of the contour was continued in all fields pruned. Growth of wood in most fields was good but the higher jat fields showed far better growth than No. 2 and 3 fields, which consist of extremely mixed, rather low jat bushes.

Replanting of Old Tea.—The balance of No. 10 new clearing was planted up in June, 1954, and the percentage of success was extremely good. Only 2 per cent. supplies were needed over the 2½ acres.

The uprooting of tea in No. 1 field was discontinued, pending the arrival of a new winch, but it is hoped that the balance of the old tea area will be cleared in 1955. An estimated 5½ acres of cleared and conditioned land was replanted on the contour with a selection of T.R.I. clones. Unfortunately, unusual dry weather was experienced soon after much of this area had been supplied and the percentage of loss was higher than in the No. 10 new clearing. The area planted, in clone 2025, well before the dry period, has however come away extremely well and all plants show healthy and vigorous growth. The large new nursery, opened up in No. 1 field, was used to carry out nursery shade experiments and some success was achieved with the use of round-iron metal frames with a covering of open mesh, coir weave.

Further experiments to decide upon the best weave will continue.

Weeding.—The average cost of weeding was reduced from Rs. 12/19 per acre per round to Rs. 11/26 and, while this is an improvement, it is hoped that a further reduction will be made, now that the estate is clean.

The estate contracts have proved very popular and only a small acreage remains to be weeded by daily labour.

Factory and Machinery.—Considerable work was done on the factory, with a view to improving factory hygiene. All ceilings have been painted white, in accordance with a colour plan provided by Messrs. Imperial Chemical Industries; the balance painting of both walls and machinery will be completed during 1955. Some major alterations were effected giving a larger office to the Institute's Technologist and allowing greater space for experimental work.

The purchase of an industrial type vacuum cleaner greatly assisted the efforts to maintain a clean factory and this particular machine has proved to be most satisfactory.

All the factory machinery was carefully checked and repairs carried out when necessary.

A modification was made to the hot air bulking chamber, which was extended to the top loft, giving a satisfactory improvement in the flow of air through this loft.

Labour.—Labour was found to be adequate for all works including T.R.I. labour requirements.

General.—1954 proved to be a most satisfactory year both for crop harvested and prices realised. An excellent cover of tea has been maintained throughout all fields and the bushes appear to be healthy and vigorous. There is every reason to hope that the increase in crop will continue and that 1955 will again prove to be a good year in this respect.

E. S. ROSE,
Superintendent.

METEOROLOGICAL OBSERVATIONS—1954.

ST. COOMBS

(Laboratory Gauges)

MONTH	TEMPERATURES °F						Mean Relative HUMIDITY %	RAINFALL		RAINY DAYS		SUNSHINE	
	Mean Maximum	Difference from average (20 years)	Mean Minimum	Difference from average (20 years)	Adopted Mean	Mean on grass		Inches	Difference from average (20 years)	Days	Difference from average (20 years)	Hours	Difference from average (20 years)
January	73.9	—0.4	57.4	+2.1	65.6	54.8	81	3.62	+0.48	16	+ 7	141.90	— 62.49
February	76.7	+0.2	55.3	+0.9	66.0	51.0	64	1.27	—0.87	10	+ 3	155.10	— 63.95
March	76.7	—1.1	57.7	+2.4	67.2	54.4	71	3.46	—0.99	16	+ 4	188.58	— 46.03
April	76.2	—1.4	58.5	+0.7	67.4	55.8	83	7.54	+1.22	20	+ 4	117.58	— 86.75
May	74.6	+2.9	60.2	+0.5	67.4	60.7	86	8.38	—3.30	18	— 1	127.33	— 37.55
June	70.7	—0.1	59.9	—0.5	65.3	58.4	87	6.35	—5.59	27	+ 1	85.38	— 11.55
July	71.5	+1.4	59.2	—0.3	65.3	58.4	85	8.48	—3.61	21	— 5	102.57	— 4.79
August	69.1	—1.8	59.7	+0.5	64.4	60.3	91	14.66	+4.77	28	+ 3	49.30	— 63.63
September	71.2	—0.9	58.8	+0.5	65.0	58.2	86	5.09	—3.16	19	— 2	125.38	— 13.01
October	71.0	—2.3	58.2	+0.5	64.6	57.7	85	12.20	+2.67	25	+ 3	107.03	— 44.88
November	73.6	0	55.4	—1.9	64.5	52.6	80	3.61	—4.11	13	— 7	193.97	+ 34.71
December	70.9	—2.6	57.4	+1.3	64.2	55.6	82	8.62	+3.11	21	+ 6	116.25	— 52.78
	73.0	—6.1	58.1	+6.7	65.6	56.5	82	83.28	—9.38	234	+16	1510.37	—452.70
	Means							Totals					

REPORT OF THE DIRECTOR FOR THE YEAR 1954

The most significant feature in 1954 was the greatly increased income of the Institute. Contributions made by the cess totalled Rs. 2,001,417, as compared with Rs. 839,173 in 1953, this increase being due chiefly to the higher rate levied (55 cents per 100 lbs. of tea exported as compared with 30 cents in 1953), and also to the larger crop exported in what was a most favourable year for tea.

Consequently it was possible to give attention to much work, which had fallen into arrears due to the previous shortage of money. A sum of Rs. 170,000 was sanctioned by the Board for repairs and decoration of staff houses, and a start was made on this work. A survey of the existing furniture was also made.

A sum of nearly Rs. 50,000 was approved to relay 3 miles of the main cart road and bring it into first-class condition. This work will be undertaken in 1955.

The Board made generous contributions to the newly formed Institute Sports Club. A tennis court was laid, and a grant made to provide for cricket gear and for the use of the District Club ground at Radella. Our thanks are due to the Radella Club Committee for the facilities provided by them in this connection.

During the year two new senior officers were appointed. Mr. J. V. Harbord assumed the newly established post of Technical Assistant to the Director on June 1st and Dr. B. A. Baptist filled the long vacant post of Entomologist from December, 1st. Further, Mr. J. A. H. Tolhurst made a good recovery from poliomyelitis and was able to return to Ceylon and resume duty as Agricultural Chemist from May 17th.

For the first time, therefore, for many years the Institute had both the funds and senior staff to tackle some outstanding problems. The most serious of these is shot-hole borer, a pest which is causing widespread damage, particularly in the low and mid-country. At higher elevations, mites have been causing increasing alarm among planters. Dr. Baptist's appointment was the first necessary step required for starting intensive investigations into the two problems, and the tempo of these investigations may well be stepped up in 1955.

During the summer Mr. C. A. Loos made a visit to the United States of America sponsored by the Food and Agricultural Organisation of the United Nations. On his return he drew up a programme of intensive research into the whole problem of eelworms, which in certain parts of Ceylon have caused serious loss of crop. This investigation is a long term project.

The work of Mr. Tolhurst on the nutrition of the tea bush, particularly his discovery of magnesium deficiency, merits close attention. Mr. Tolhurst in his report emphasises the gaps in our fundamental knowledge on certain aspects of agricultural chemistry, both regarding our soils and the tea bush, and he will continue an extensive soil survey, initiated by the Director in 1953, designed to obtain as much of this missing information as possible.

Parallel with this survey Mr. Webster has begun an investigation into the distribution and activities of the fungus flora of tea soils to ascertain the part played by these biological factors in building up and maintaining soil fertility.

The vegetative propagation programme has been continued, and the best St. Coombs clones have maintained their previous outstanding promise. Their remarkable yields have greatly stimulated interest and focussed attention on the necessity for expanding the work to obtain clones of similar standard suitable for the low-country and Uva dry zone. Plans were approved by the Board for the establishment of two clonal proving stations in the low-country and Uva, where the Institute will carry out this programme, and it is expected that a start will be made in 1955.

Mr. J. Landreth, the Engineer, resigned his post in October and a Maintenance Engineer, Mr. D. V. W. Perera, was appointed in the same month.

In November, Mr. Lamb, Director, informed the Board of his intention to resign in May, 1955, in order to take up an appointment in West Africa. Further plans for long-term research have therefore been postponed for the consideration of the new Director.

However, since any expansion of staff is contingent on building new houses—indeed not all the present staff have their own houses—the Board approved plans for a building programme. The co-operation of the Government Town Planner was sought in order that the new buildings should be integrated with those existing to make a properly planned township. The necessary preliminary town survey will be undertaken in 1955, and it is hoped to start building in the early part of 1956.

Summing up, 1954 may be considered a good year for the Institute. St. Coombs estate made a record yield, a start was made with several important problems hitherto not investigated due to lack of staff and funds, and plans for further expansion were made and are under consideration.

J. LAMB,
Director.

NOTE:—*As the vacant post of Entomologist was not filled until December, no report of the Entomologist is included in the reports of the staff which follow. Details of the Entomological work carried out during* 1954 *will be found in several reports, particularly those of the Pathologist and of the Officers-in-charge of the Passara and Low-Country Sub-Stations.*

G. B. PORTSMOUTH,
Acting Director.

17th July, 1955.

REPORT OF THE AGRICULTURAL CHEMIST FOR THE YEAR 1954

General.—The agricultural Chemist, Mr. J. A. H. Tolhurst, resumed his duties early in 1954 and took control of the research programme of the Agricultural Chemistry Department.

The Biochemistry Department had been working almost entirely on lines which might be termed soil biochemistry under the guidance of the Director. In the latter part of the year Mr. Lamb delegated much of the responsibility to the Agricultural Chemist, since the two departments were carrying out very similar work. Consequently this report is written by the Agricultural Chemist with due acknowledgment to the part played by Mr. Lamb in promoting the initial research.

AGRICULTURAL CHEMISTRY

Soil Survey.—In the report for 1953 a series of studies on soil profiles was mentioned with emphasis on the nitrification processes in tea soils. This survey has been continued and, latterly, considerably modified, the better to bring out certain interesting trends and to make the work as comprehensive and practicable as possible.

Examination of a soil profile pit to a depth of six feet must be considered as an ideal, where the survey has to be conducted by the Agricultural Chemist himself in the course of his other duties. A soil survey has either to eliminate or allow for so many variable factors that the choice of sampling sites and the interpretation of chemical analyses should be made by the same person. Therefore the simplest sampling method was adopted to allow the greatest amount of information to be gleaned without prolonging the survey at the expense of urgent problems.

The top six inch layer of soil and the next six inch layer were found to give as good a picture of total organic matter and nitrogen as the elaborate profile pit, which finding enabled the number of samples to be increased enormously.

It is still too early to give detailed comments on the results, as future analyses may change the picture slightly. It is, however, possible to say that, allowing for sampling errors, tea soils show certain surprisingly constant features. Wherever possible jungle soil adjoining the tea was sampled to give a comparison between cultivated and virgin soil.

The salient points are:—

1. Elevation is by far the dominant factor governing the amount of organic matter and nitrogen in tea soil. It was to be expected that organic matter would increase at the higher, cooler elevations, but, although this is generally true, there is a most unexpected depression in the curve. In what may be termed mid-country regions the soil organic matter is decidedly lower than would be assumed from a study of the low-country and up-country soils.

2. Soil exposure tends to lower the organic matter, but not to such an extent as might have been supposed. This factor is subordinate to the effects of elevation.

3. The many other variables in tea cultivation, such as pruning, shade trees, weeding, slope, aspect, etc. seem to have negligible effects, with the possible exception of rainfall. It may later be established that certain very high rainfall areas are richer in organic matter.

4. Jungle soils are almost always richer in organic matter and nitrogen than adjoining cultivated soils, but much of this is due to raw humus and live roots in the top few inches of jungle soil. This can not be termed humus in the usually accepted sense, and the decrease following cultivation need not be taken as a deterioration. The jungle soil is, in any event, not so very much richer than the tea soil. The jungle subsoil, at six to twelve inches depth, is much poorer than the top soil and is very similar to the tea subsoil.

From these notes it can be seen that the practice of tea growing, often following many years of coffee, has not had such an alarming effect upon organic matter as is often assumed. Appearance of the soil is totally unreliable as an indication of the amount of organic matter.

It must be emphasised that the organic matter discussed is the total. It might be of more practical value if we could devise an analysis which would show how much was in an active form and how much was merely the resistant, inert, residue. The Biochemistry report will show how this problem is being tackled with regard to the total nitrogen.

Analyses for mineral nutrients will be done on the same soils once the actual survey is completed and energy can be concentrated on laboratory work.

Plant Nutrition.—At the same time as fundamental information is being obtained from soil studies, covering all the major tea growing areas, a start has been made on the problems of nutrition of the tea bush from another aspect. The chemistry of the leaf itself can be a very good guide to the response of the bush to the particular conditions under which it grows. Fortunately it is possible to diagnose certain nutritional disorders by virtue of unusual colours which develop on the leaves in characteristic patterns. Using this "visual symptom" technique, at least one manurial deficiency of practical importance has been detected over an extensive area, namely magnesium deficiency.

(1) Magnesium deficiency.—The main characteristics are shown in the first fully matured leaf below the flush and may be summarised as follows:

1. Dull, lacking the normal waxy sheen.

2. Sickly green with a yellowish brown mosaic towards the centre of the leaf and between, not crossing, the main veins.

3. In most bushes the leaves fold upwards very markedly and are brittle.

Fortunately the symptoms show before much effect is reflected in the yield, but a few advanced instances have been found, where the yield was falling rapidly.

A future publication will contain a discussion on practical implications of this disorder, but it must be emphasised that the present increasing yields in Ceylon tea offer no cause for complacency. In fact the reverse is true. If no

magnesium manures are given or insufficient quantity is applied, the high yields of crop merely mean that the soil is being brought rapidly nearer to the point of magnesium deficiency. As a soil in this condition is usually more difficult to correct, it is an economic proposition to ward off trouble rather than to wait for it.

For this reason we are suggesting one initial dressing of 5 cwt. per acre of dolomite as a prophylactic, pending the results of field trials.

Dolomite is a rock native to Ceylon and should eventually be available in sufficient supply. Present supplies contain about 20 per cent. magnesium oxide (MgO) and sell at a little over Rs. 200/- a ton, and may be obtained either as the crushed rock or as the burned and slaked dolomite. As yet we can not express a preference for one or the other. Used at 5 cwt. per acre one application of dolomite will not normally have an adverse effect on soil pH but, if it is feared that the pH is already too high, commercial epsom salts at 100 lbs. per acre per annum would be safer.

Inclusion of 1 lb. of epsom salts in every 10 gallons of copper spray will be tried as an alternative treatment when the south west monsoon begins, as this method promises to be easy and rapid.

It was found in the diagnosis of magnesium deficiency that the tea bush can absorb magnesium through its foliage, and in other trials manganese and iron were absorbed. All these results were based on the improvement of colour or growth on bushes showing certain visual symptoms. All the sprays used were given as solutions of the sulphates, with a wetting agent, and applied as a drenching spray. These points are important, and equally so are the concentrations of the compounds. Magnesium sulphate was at 2 per cent., manganese and iron sulphates at 0.2 per cent., and the Teepol wetting agent was at half a pint per 100 gallons. Exceeding these strengths or omitting the wetter sometimes led to leaf damage.

Magnesium deficiency is widespread over the world and in the major crops magnesium is being rapidly accepted as a normal manure. This attitude must be adopted sooner or later by the Ceylon tea growers, and, as an example of the extent of the deficiency, we will list the districts where symptoms have been seen to date. Most of these are still in a mild stage:—

Rozelle and Lower Dickoya
Upper Kotmale
Gampola
Lindula and Nanu Oya
Uda Pussellawa and Attampettia

This appears to be the first record of magnesium deficiency in tea, since the only other mention in the literature describes a symptom which is present in Ceylon tea but which has no resemblance to the magnesium deficiency symptom. These workers did not attempt to cure their symptom by the addition of magnesium, an essential test, and we have found that the same symptom is not cured by magnesium, or by any other known nutrient.

Analyses were done by Mr. Ramaswamy on a St. Coombs tea soil which are of interest here.

Table 1 shows the total reserve of calcium and magnesium in the soil profile as estimated by hydrofluoric acid digestion.

Table 1. *Total calcium and magnesium in St. Coombe profile.*

Depth in inches	As parts per million in dry soil	
	Calcium as CaO	Magnesium as MgO
0– 6	945	3,635
6–12	777	3,185
12–24	644	1,420
24–36	434	1,265
36–60	532	1,490
60–84	350	1,855

When it is remembered that these figures represent nutrients which are by no means all available to a plant, and will not become totally available until the minerals weather, it can be seen that the reserves are alarmingly low. A figure of 500 p.p.m. in any 6″ layer in the table may be taken to represent 1,000 lbs. per acre.

In the course of other work top-soil was leached with ammonium sulphate solution and the results will give a rough guide to some of the effects of this particular manure. 1.7 kilograms of soil were leached with 1 litre of solution containing 1.7 grammes of ammonium sulphate and the leachate analysed.

A similar trial was run with water alone, as a control:

Table 2. *Bases leached by ammonium sulphate and water from a St. Coombs tea soil.*

Base	As parts per million in dry soil	
	Water	Ammonium sulphate
Potassium; K_2O	8.2	78.0
Calcium; CaO	7.2	9.5
Magnesium; MgO	0.8	2.0
Iron; Fe_2O_3	1.2	2.8
Aluminium; Al_2O_3	3.9	4.3
Sodium; Na_2O	10.1	11.0
Ammonium as sulphate	69.0	—

Soil from the same field was used in these two experiments and the low calcium and magnesium is reflected in both. The tea itself is beginning to show magnesium deficiency symptoms. The increased loss of magnesium following sulphate of ammonia is marked, but not so much as that of potassium. The implication is that the major base in this soil was potassium, supplied by manure, as the parent soil is likely to be as poor in potassium as it is in calcium and magnesium. Rock analyses done by Adams many years ago show most clearly how poor the Ceylon rocks are in these three important nutrients and these preliminary experiments confirm the need to consider calcium and magnesium as well as potassium in the manurial programme.

(2) Manganese and Soil pH.—In September, 1954 an instance of manganese deficiency was reported under rather unusual circumstances, and

again this was the first record of such a disorder in tea. No more will be said of this, as the conditions were abnormal and as manganese may come into prominence from another angle.

Manganese is one of the trace elements, which means that it is essential to the life of green leaved plants but in very small amount. As with all the trace elements too much can cause as much harm as too little, and we must warn anyone against over-optimistic experimenting. In the 1953 report we commented on the high manganese content of leaf flush, from the long term N.P.K. experiment at St. Coombs, to the effect that some connection was apparent between manganese content and the rate of application of sulphate of ammonia.

The availability of manganese to the plant depends to a large extent on the acidity of the soil, and it is well known for some crops to suffer from an excess of manganese in too acid soils. Unfortunately there have been no detailed pH records on the soils of this experimental plot, and with the exception of twelve determinations done in 1937 we can not correlate pH with manurial treatment. This is to be remedied in the future.

The pH values from the twelve plots are of interest. Six plots had received 40 lbs. of N per acre per annum in the form of blood meal over six years, and the other six plots had had the same dose of N as sulphate of ammonia. Plot variations in pH were small and the means may be taken to show the effect of six years' manuring with sulphate of ammonia in increasing the soil acidity.

	Sulphate of ammonia.	Blood meal.
pH	4.88	5.12

Examination of past advisory analyses suggests that there has been a steady fall in the average soil pH, and with the ever increasing use of sulphate of ammonia, with no alkaline manures, it is interesting to speculate on the future increase in acidity.

Further, the only detailed experiment on the optimum pH for the tea bush was done in 1928 by C. H. Gadd, who showed that the best growth was obtained at a pH of around 6.0 to 6.3. This is difficult to reconcile with the present attitude that as long as the soil is more acid than 6.2 one need not be concerned, and we can not afford to leave the position as it is. A pot experiment has been begun to repeat Gadd's original work, and more work on liming will be done in the course of the soil biochemistry, to be reported below.

Soil acidity has an influence on the uptake of nutrients and hence the efficiency of utilisation of manures; therefore as manuring becomes more intense it becomes more necessary than ever to be able to control its effects. We are not aware that the Institute has ever stated that tea does not require lime, but merely that it does not require too much lime It may be true that mature tea does not grow well in soil above pH 6.0 to 6.5 but, it is quite unjustifiable to assume that it will grow at its best at every degree of acidity below pH 6.2, our accepted limit.

(3) Low-country chlorosis.—Under this title we describe a further visual symptom which is very common in mid and low-country tea.

In contrast to the magnesium symptom, this is represented by a bright yellow or orange chlorosis with the leaf remaining glossy, flat and pliable, and a pronounced green network of the smallest veins. There is no reference in the literature to suggest a cause, but preliminary work points to an excess of manganese in such leaves.

Possible associations with sunscorch and shot-hole borer attach are being followed, and the relation to soil acidity is now under investigation.

Advisory Work.—The remarks on soil pH above apply also to nursery soils, but here the disastrous effect of too high a pH is well known. Nevertheless a surprising number of nursery failures are sent in where the reason is obviously too high pH.

The Institute will undertake any pH determinations, and if nursery soil is sent in before planting, either with seed or cuttings, much financial loss could be avoided. A pH which is a little below the accepted limit of 6.2 may not be satisfactory if the nursery is watered too heavily. As some of the samples reach us in a bad condition an article is proposed for a future *Tea Quarterly* setting out the requirements necessary for the best value from such a service. No other form of chemical analysis is possible with our facilities.

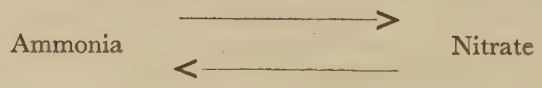
Conclusions.—Tea nutrition has been tackled from a fresh angle during the past year, and although the major manurial requirements are not being overlooked it must be remembered that the greatest efficiency from N.P.K. can only be gained by considering all the nutrients required by crop plants. It is accepted that there are fifteen elements essential for plant growth and, unless tea is a most peculiar exception, our present N.P.K. mentality will have to be capable of expansion.

BIOCHEMISTRY

Work on the complex problem of the nitrogen cycle has occupied the past year, and although some unexpected, and sometimes apparently conflicting, results have been obtained there are sufficient data for a more fundamental approach to be planned for the future.

The outstanding question of practical importance is still that concerning any preference the tea bush may have for ammonium or nitrate nitrogen. A further query would require to know what happened to either of these forms under the varied soil and climatic conditions to which Ceylon tea is subjected. The present high correlation between sulphate of ammonia as the nitrogenous manure and crop yield is undisputed, but, particularly in view of remarks in the preceding report, research should aim to anticipate the long term effects of manuring practices.

These implications belong to agricultural chemistry, and this department has two experiments planned to follow the nitrogen cycle in the field. The first of these has given promise of answering the ammonia versus nitrate question by adopting a well known technique of chemical soil sterilisation. Not all the problems can be tackled on a field scale as the reactions



are in such a fine balance that the strict control of conditions, obtainable only in the laboratory, is necessary to avoid erroneous deductions from experiments.

Mr. Ramaswamy has conducted this aspect of the work, and reports:—

Lysimeter Experiment.—Weekly analyses have been continued on the drainage from the four lysimeter tubs, two with tea bushes and two with bare soil.

The balance sheet between the nitrogen added, all of which was in the nitrate form, and that recovered in the drainage is shown in table 3.

Table 3. *Nitrogen balance sheet in lysimeters.*

	Nitrogen as gms.			
	Bare soil		With bush	
	No. 1	No. 2	No. 1	No. 2
Total N added	27.8	27.8	27.8	27.8
Total N recovered	19.9	19.4	4.7	7.3
Nitrate N recovered	18.4	17.7	4.3	6.9
Ammonia N recovered	1.5	1.7	0.4	0.4
Soil pH	4.1	4.2	4.5	4.1

A heavy application of potassium nitrate during wet weather resulted in a very sudden increase in ammonia in the drainage. A lighter manuring in rather drier weather gave only a very small increase in ammonia.

Laboratory experiments were done to follow up this increase in ammonia, using soil from a high yielding field on St. Coombs. The soil was saturated with water and corked in flasks, after air had been driven out with carbon dioxide, to simulate anaerobic, or stagnant, conditions. Potassium nitrate had been added at the rate of 20 lbs. nitrogen per acre, and the soil was analysed at intervals over 18 days at 30°C. to see how much nitrate had been lost. Soil which had come from the top six inch layer (0-6″) and from the next layer (6-12″) showed a loss of most of the nitrate, but soil from layers lower down the profile showed no loss at all. The experiment was repeated with only one third saturation with water and the general loss of nitrate was very slight.

Similar experiments showed that the missing nitrate was not entirely accounted for by the increase in ammonia. Examination of the soil by the Mycologist showed such a heavy population of soil fungi that it is reasonable to assume they had absorbed much of the nitrogen in their tissues. It is interesting to speculate on the usefulness of such a process in the field, if it occurs, as providing a means of protecting the readily soluble nitrate from washing out under heavy rainfall. There was no evidence to show that the nitrate was reduced to nitrite or ammonia before being absorbed, but this remains an open question.

Nitrification Experiments.—Incubation of moist soil at 30°C, with or without calcium carbonate, gave a surprisingly low rate of nitrate formation. Soil from 0-6″ and from 6-12″ was again much more active than the lower layers, but the maximum conversion of 1.2 per cent. of the total nitrogen in 32 days to nitrate compares unfavourably with 3.4 per cent. in 28 days obtained by Trinidad workers. The maximum nitrification in our experiment was from the top soil plus calcium carbonate.

When the sub-soil layers were inoculated with soil from the top layer practically no increase in nitrification took place.

Ammonia in the soil profile.—Soil from layers down the profile was analysed in such a way as to separate the available and fixed ammonia fractions. The total ammonia was extracted with hydrofluoric acid (HF), and the exchangeable ammonia estimated by rather drastic extraction several times with N.KCl at pH 1.0. The hydrofluoric extraction was repeated on ignited soil, and the following table (table 4) gives the relative percentages of ammonia nitrogen obtained in the different fractions.

Table 4. *Nitrogen in St. Coombs cultivated soil profile.*

Depth in inches	% Total Nitrogen	% Nitrogen in form of ammonia		
		Air dry soil		Ignited soil
		KCl	HF	HF
0–6	0.301	0.007	0.016	0.0008
6–12	0.224	0.006	0.015	0.0012
12–24	0.066	0.003	0.012	0.0020
24–36	0.028	0.004	0.003	0.0023
36–60	0.021	0.003	0.003	0.0020
60–84	0.027	0.003	0.003	0.0016

The figures suggest that little nitrogen is fixed by the inorganic soil colloids, but that an appreciable amount of the organic nitrogen is in a highly resistant form not extractable by hydrofluoric acid. This had been deduced from the high nitrogen figures obtained in the soil survey from soils which had been in cultivation for upwards of sixty years under climatic conditions apparently very favourable for mineralisation. Hydrofluoric acid was only able to dissolve a part of the total nitrogen, varying from 5 or 6 per cent. in the two top layers to 10 or 12 per cent. in the lower layers.

It is difficult to correlate some of our findings on nitrification processes without much more fundamental work, but a few points of interest may be noted in conclusion.

There is obviously a very large reserve of nitrogen persisting under prolonged cultivation but of a very low availability. Contrary to findings in the majority of temperate zone soils, nitrate formation does occur at an appreciable rate in the field in highly acid soils; thus, nitrate at 20 parts per million has been found in a soil at pH 4.0.

Miscellaneous.—In addition to various analyses of teas in conjunction with the Technologist an electronic moisture meter has been calibrated. The findings may be of interest to superintendents wishing to use the instrument.

"Kappa" Electronic Moisture Meter.

1. Calibration on each estate is advisable as the air temperature affects the reading.

2. The tea must be packed in the cell of the meter in the same way each time. The personal factor is very important here.

3. The sample should be weighed to within a 1 per cent. error.

4. Calibration for St. Coombs B.O.P. was found to be satisfactory for all other grades of St. Coombs' teas.

J. A. H. TOLHURST,
Agricultural Chemist

REPORT OF THE TECHNOLOGIST FOR THE YEAR 1954

Advisory.—35 visits were made to factories during the year, and the indications are that closer attention is now being paid to manufacture in general. Most of the problems encountered in advisory work pertained to factory organization. By and large, it can be said that methods of manufacture today are on a much more organized footing than what they used to be a few years ago. Correct matching of rolling and firing equipment is really one of the basic requirements of successful manufacture, and its importance is being more and more realized.

Withering.—Research on manufacture during the year was mainly concerned with the effect of low temperatures in withering on quality. A brief reference to this subject was made in the last annual report. The work has since been extended to experiments on a larger scale and the results on the whole indicate that only good quality leaf benefits by withering at low temperatures. By "good quality leaf" is meant leaf possessing intrinsic quality, or quality which is the result of favourable weather conducive to its production. From an examination of the data available on the 58 experiments carried out, the conclusion seems inescapable that when leaf is really lacking in quality nothing is to be gained by 'cold' withering.

The main difficulty in evaluating this experimental work was to assess the effect of the weather that prevailed prior to and during each test. If, for instance, conditions were favourable for natural withers at a time quality was at a low level, 'cold' withering had very little effect. Likewise, a sudden drop in temperature during the night proved beneficial to the control. On the other hand, if heated air had to be used in the case of the control for good quality leaf, on account of a freakish change in the weather, 'cold' withered leaf generally produced the better tea. These uncontrollable factors made it extremely difficult to assess the real value of low temperatures in withering.

One of the objects in carrying out experiments on a larger scale was to determine operational costs. With the co-operation of Messrs. Walker Sons & Co. Ltd., a plant was constructed to hold about 500 lbs. green leaf to provide the minimum amount of withered leaf required for a commercial roller. The leaf was spread on wire mesh trays at approximately 1 lb. per 5 square feet. This was found to be the most economical spread in relation to the capacity of the plant and the number of trays that could be handled conveniently.

Except for the compressor motors which supplied the necessary power the whole installation was self-contained. This arrangement enabled the heat of the refrigerant vapour in the condensing coils to be utilized for re-conditioning the air that had passed over the leaf. The same air was thus used all the time and its direction of flow changed at frequent intervals by means of doors operated from the outside.

Preliminary trials indicated that, for a load of 500 lbs. green leaf, the lowest temperature at which the plant could function without the period of wither being unduly lengthened was 60°F. Investigations at lower temperatures were therefore not undertaken since this would have meant reducing the load and increasing operational costs.

The general procedure in operating the plant was to first remove surface moisture at about 80°F, in case the leaf was wet, and then withering at 60°F. For surface dry leaf the temperature of the air was maintained at 60°F from the time spreading was completed. At this temperature and a hygrometric difference of 6°F, more or less, the leaf took about 20 hours to wither. Air flow was reversed at hourly intervals in accordance with normal practice for bringing about the best uniform wither possible.

Tests were carried out comparing leaf withered at this low temperature with leaf spread at about the same rate on hessian tats and withered in the same period. It was not possible of course, on account of the vagaries of the weather, to have unchanging conditions for the control on each occasion an experiment was carried out. However, other factors likely to influence the results were kept constant as far as possible.

The marked influence of weather on quality was clearly borne out by the results obtained from the small scale plant (mechanical withering). On 29 experiments carried out, the cold wither was preferred on 20 occasions and only once was the control considered slightly better. On a similar number of experiments conducted with the larger plant the results were as follows:—

'Cold' preferred to control on 16 occasions.
„ equal „ „ „ 3 „
Control preferred to 'cold' „ 10 „

The plausible explanation for the marked preference for the 'cold' wither on the smaller scale is that these experiments were conducted in the early part of the year when the weather was most favourable for the production of quality teas above the average. The results could not have been due to the different method of withering because on the few occasions the 'cold' wither was not valued higher, wet weather prevailed, similar to what was experienced during the greater part of the period in which the large scale experiments were carried out.

The average power consumption for withering at 60°F (inclusive of the power for driving the fans) was 1.4 electrical units per lb. of made tea. At 8 cts. per unit, the cost comes to approximately 11 cts. per lb. of made tea.

It must be pointed out of course that the general design of the plant will not satisfy commercial requirements. It is most likely that if, instead of a withering chamber, a drum was substituted operational costs would have been lower. However, it must be concluded from the results obtained that, though withering at low temperatures is advantageous at certain times of the year and for certain types of leaf, the use of an air-conditioning plant solely for low temperatures makes the cost of withering prohibitive.

Nevertheless, considering that equipment employing this principle affords a better control of the wither and other advantages when compared with traditional methods, its possible application in tea factories cannot be lost sight of. Since the plant can be operated to give cooled air or heated air at will by a simple adjustment to enable the transfer of the required quantity of heat to the interior of the condenser, air-conditioning for withering has considerable possibilities. The plant may be operated at lower temperatures only when conditions are favourable to the production of quality teas and

more economically at much higher temperatures of 90°F or so at other times. One limitation in its development is the capital cost but this might be counterbalanced by the following worth-while advantages such an application will offer:—

1. A full control of the wither,
2. A temperature range of 50° to 90°,
3. No fire risk,
4. Less attention—almost fully automatic operation is feasible,
5. Reduction in labour costs, and
6. Better quality teas by operating it at the temperature most suitable for a particular type of leaf or season.

Effect of Age from Pruning.—The improvement in the quality of a tea as leaf gets older is best seen by comparing teas manufactured from tipping leaf and those from older leaf. As leaf gets older from pruning a gradual improvement takes place and, according to data already published (Bulletin No. 15, page 26), significant differences between teas differing by only 4 months in age from pruning have been observed. These results were obtained from adjacent plots on the same field of different ages from pruning varying from 27 to 44 months.

It was found that though a significant difference was found between a 31 to 44 month tea and a 35 to 48 month tea, there was no difference between the former and a 27 to 40 month tea. It is very difficult to assess the true significance of these results. However, the availability of clonal material afforded the opportunity of examining this question further.

Two clones, one with quality above average and the other mediocre were selected for the experiment and manufactured over a period of 12 months at monthly intervals. They had been planted in 1942 and were in the 3rd cycle of pruning. Their ages at the commencement of the experiment were 9, 21, and 33 months. The two main characteristics, colour and quality, were expressed on a basis of marks, the maximum possible being 10. The average marks gained by these teas over the whole period were as follows (Table 1):—

Table 1. *Effect of age from pruning on colour and quality*

Age from pruning	Good quality clone		Mediocre clone	
	Colour	Quality	Colour	Quality
9-21 months	6	7	6	5
21-33 „	6	7	6	5
33-45 „	5	8	5	5

It may be noted that these teas were manufactured by the mincing machine technique. Nevertheless, there is every reason to believe that once a bush has reached a certain age after a prune the effect of the length of a

cycle is marked only in case it possesses intrinsic quality to a high degree. This was particularly found to be so in the teas made during the flavoury season. Whilst no difference was found between the different ages in the case of the mediocre clone, the other gave the following results:—

	Quality marks
9 months ...	7
21 „ ...	7
33 „ ...	9

On one occasion the oldest leaf obtained 10 marks for quality.

Another interesting feature of the results was that, contrary to expectation, the older leaf did not give an improved infusion, suggesting once again that, when a bush has passed the tipping stage and has been in regular plucking, the general characteristics of the final product are not affected to a marked extent.

These conclusions must, however, be regarded as purely tentative as the abnormal method of manufacture must be allowed for.

Greeness and Maltiness of Liquors.—These have been puzzling features for a long time in tea-making, the former supposed to be due to under-withering and the latter to high firing. Numerous experiments were carried out in the course of the year to investigate this question, which is still receiving our closest attention. From the evidence so far available, it appears that if these two characteristics are consistently present to a marked degree they are intrinsic characters.

A greenish tea cannot be made malty by any method of manufacture so far known but the degree of greeness may be reduced by the following measures:—

1. A longer period of wither.
2. A higher temperature in withering.
3. More rolling.
4. A longer period of fermentation.

It must be remembered, however, that the improvement will be achieved at the expense of quality.

General.—(1) The 'Kaybee' Infra-red Moisture Tester, Type X-14.—Comprehensive tests were carried out on this meter, the results of which were published in the *Tea Quarterly* Vol. XXV, Part IV. It proved to be quite satisfactory and on account of the rapidity with which a moisture determination can be made it should be found particularly suitable for use in tea factories.

The instrument tested had a scale graduated 0-30 per cent. An improved model has since then been introduced with a range of 0-15 per cent. The larger divisions will thus indicate moisture contents with greater precision. It is now undergoing tests.

(2) Prevention of deterioration of hessian tats.—In co-operation with the Shell Company of Ceylon Limited tests were undertaken, primarily for taint, on hessian impregnated with wax and "Flintkote" emulsions.

Trials are now being carried out on hessian treated with "flintkote" emulsion to determine what degree of protection it can afford a withering tat against deterioration.

(3) Asphalt fermenting surface.—Tests carried out on a fermenting platform consisting of a concrete base and a layer of Limmer and Trinidad "Mastic Asphalt" revealed that it was a satisfactory surface for fermenting.

(4) Foliar Nutrient Spraying.—Six manufactures were done for the Plant Physiology Department to test the effect of nutrient spraying on quality. No difference was noted.

(5) Clonal manufacture.—102 manufactures of clones were done for St. Coombs and other estates.

(6) Crop protection experiments.—16 separate manufactures were carried out on the single miniature roller for the Pathology Division.

Acknowledgments.—It is a pleasure once again to record our appreciation of the invaluable help given by the Tea Tasters in Colombo, on whose opinion we are entirely dependent for the evaluation of our experimental work. To all those who have assisted us we extend our grateful thanks.

E. L. KEEGEL,
Technologist.

REPORT OF THE PLANT PHYSIOLOGIST FOR THE YEAR 1954

General.—In addition to his own duties the Plant Physiologist acted for the Director during the latter's visit to Burma from 21st November to 7th December.

Mr. E. S. Rajiah resigned his post as Technical Assistant on 11th June, 1954. Mr. L. M. de W. Tillekeratne, B.Sc. (Ceylon) was appointed on 1st October, 1954, to fill the vacancy.

586 letters were received and 647 despatched. 43 specimens were received for identification and report.

A total of 35 visits to estates were made and 5 Planters' Association meetings attended during the year.

Over a hundred and fifty dead V.P. plants were received for examination and report. The cause of death of most of the plants examined was due to too deep planting. Like seedlings, rooted internodal cuttings should be planted so that their collars are only just below ground level. Many of the other plants showed symptoms of insect injury.

Tea Selection and Vegetative Propagation.—The 39 clones planted in 1953 have progressed well and will be brought into plucking in 1955. 5 new clones were planted in this area, and cuttings from 6 new clones from outside estates were put out in the nursery.

(1) 1947 Clonal Area.—All these clones showed excellent recovery after the 1953 pruning, when they were tipped to about 5″ and again brought into plucking for their second cycle. The calculated yields of the higher yielding clones for the first year of this cycle are shown in Table 1.

Table 1. 1947 *Clonal Area. Calculated yields for 1st year of 2nd cycle.*

Clone	Calculated yield, lbs. per acre
2024	3,995
2026	3,530
2025	3,200
2046	3,100
2016	2,790
2043	2,675
2023	2,475
2022	2,310
2021	2,045

All clones show increases in yield in comparison with the last year of the previous cycle, and only two have given a yield of less than 1,000 lbs. per acre; the majority yielding over 2,000 lbs. per acre. Clone 2024, besides giving a record yield of nearly 4,000 lbs. per acre, has continued to produce teas of above average quality. One taster made the following comments on leaf manufactured just over a year after pruning: "What a lovely clone it is. As you say it is still a little green but its infusion is quite dazzling besides present upcountry standard and liquor has excellent colour, point and quality."

This area was manured every four months with T.R.I. 488 mixture at the rate of 50 lbs. nitrogen per acre per application.

From data collected on banji production, it appears that some clones tend to produce more banji than others, and that the percentage of banji continues to increase with age from pruning.

Table 2. 1947 *Clonal Area—Percentage of banji by weight. First year of second cycle.*

Clone	AVERAGE BANJI PERCENTAGE BY WEIGHT				
	Plucks 1–10	Plucks 11–20	Plucks 21–30	Plucks 31–40	Plucks 1–40
2024	12.9	32.1	52.8	46.1	38.1
2026	20.3	31.8	43.5	40.7	34.0
2025	24.9	39.0	62.0	52.7	46.8
2046	10.4	21.8	36.2	31.2	26.7
2016	18.3	38.2	50.9	48.0	40.1
2023	16.3	19.8	41.4	31.2	27.6
2022	17.8	41.7	60.8	57.5	45.3
2021	19.3	32.9	41.7	45.1	33.4
25	20.0	24.5	44.3	55.1	36.3
23	13.0	18.8	24.6	31.6	22.4

The summarised results given in table 2, in which the clones used for these observations have been arranged in the same order of relative yields as in table 1, clearly indicate that there is no obvious relationship between banji production and yield. However, as the harvested crop would always appear to contain a large proportion of banji shoots, it is essential that these are plucked in the tender stage before they become hard and unsuitable for manufacture.

(2) Blister Resistant Area.—Clones 2065 and 2086, UR12, OK4, TK48, D1, MT/BG, KEN15/2, 16/3 and 22/1, KEW 14/1, 4/A4, S106 and 123 and B8 continue to be most promising. These clones were tested for quality on two occasions, and more tests will be carried out next year.

(3) Old Clonal Area.—Clones in this area have now completed 3 cycles. Although it has not been possible to maintain continuous yield records of some of the better clones, as these have been put out of plucking to make a supply of cutting material available to the estate, the mean annual yields of a few clones are shown in table 3.

Table 3. 1937-1941 *Clonal Area: Mean annual yields for the first three cycles, Lbs. per acre.*

Clone	Year planted	First cycle	Second cycle	Third cycle
1	1937	467	560	1,327
21	1938	698	988	1,925
222	1938	608	705	1,170
1,114	1941	958	1,170	2,671
1,530	1941	513	711	1,280
777	1941	668	991	1,480
1,294	1941	570	644	1,036

These yields are noteworthy for their progressive increases, in spite of the fact that none of these clones receive any spray protection against blister blight. However, even a clone like 1294, which is particularly susceptible to blister blight, has shown an average increase in yield of 74 lbs. per annum in the second cycle and an increase of 392 lbs. per annum during the third cycle.

(4) Polythene for Packing Cuttings.—Trials were carried out with bags made from polythene tubular film for packing cut shoots for transport purposes. The cut shoots, which had their basal ends tied together with a small wad of wetted absorbent cotton wool round them, were inserted into a length of polythene tube and the two ends then sealed. There are various methods of sealing this tube but the most suitable for estates to adopt is either to use adhesive tape, *e.g.* "Sellotape", "Speedfix", etc., or to fold the ends over and fasten with paper clips. In one trial cut shoots were packed in polythene bags and left in the laboratory for two weeks, after which internodal cuttings were made and propagated. Two months after planting all cuttings were alive; 52 per cent. had already rooted and the balance callussed. Results have been so satisfactory that we strongly recommend this method of packing clonal material. The polythene tubular film used was 6" width lay-flat in 150 gauge, obtainable from Messrs. Imperial Chemical Industries (Export) Ltd., Colombo.

(5) Continued propagation.—There appears to be a widespread belief that the continued vegetative propagation of a clone will eventually lead to degeneration. There is no scientific foundation for this belief, and the following experiment was accordingly laid down to show that it does not, in fact, occur in practice.

Batches of cuttings of clone No. 2024 were taken and propagated side by side in the same nursery beds from the following three sources of supply:—

A. Mother bush, 16 years old.

B. 6 year old plants grown from cuttings taken off A.

C. 3 year old plants grown from cuttings taken off B.

The experiment was laid out in three blocks, each of which contained 100 cuttings taken from each of the three sources A, B. and C. After seven months in the beds the cuttings were dug up and the rooting percentage and the total dry weights of the roots and shoots produced determined. These figures which are given in tables 4 and 5, clearly show that the process of continued propagation has no effect on the behaviour of cuttings of clone No. 2024.

Table 4.—*Number of cuttings rooted after 7 months.*

Source of supply	A	B	C
Block 1	84	85	97
„ 2	91	88	79
„ 3	90	87	81
Total	265	260	257
Percent rooted	88.3	86.7	85.7

Table 5. *Dry weights (gms.) of roots and shoots after 7 months.*

Source of supply	ROOTS			SHOOTS		
	A	B	C	A	B	C
Block 1	10.60	11.25	12.02	67.90	62.20	74.63
„ 2	11.95	10.42	11.50	77.78	73.35	56.87
„ 3	12.15	12.50	11.95	63.86	72.84	77.92
Total	34.70	34.17	35.47	209.54	208.39	209.42
Per cutting	0.13	0.13	0.14	0.79	0.79	0.81

(6) Pre-treatment of nursery soil.—There are indications that, if nursery soils are treated with fumigants or suitable insecticides, better rooting and more vigorous plants are obtained, presumably as a consequence of a reduction in the more harmful elements of the soil fauna. To test this hypothesis a replicated experiment comprising the following treatments has accordingly been laid down:—

1. Shell D-D fumigant. 5 cc every 6 inches.
2. Intox 8. Diluted to 1 in 2000 and applied at a rate of 3 gallons per 16 square feet.
3. Chlordox. Diluted to 1 in 2000 and applied at a rate of 3 gallons per 16 square feet.
4. Agrocide. 4 teaspoonfuls per 16 square feet.
5. Control. Untreated.

Cuttings of clone 2024 have been put down in the treated beds and will be removed for examination towards the middle of next year.

Green Manures.—Brief notes on species of green manure plants which have been under trial during the year are given below.

Desmodium uncinatum (Jacq.) D.C.—This legume, which is also known as Spanish Clover, is a native of tropical America. It is a quick growing perennial. Being a vigorous grower it provides a good cover. The trailing stems show no tendency to climb, but root at the nodes. It has a deep tap root and may accordingly be suitable in areas subject to drought.

Stylosanthes bojeri.—Is very similar to *S. gracilis* but appears to be a more vigorous grower. At Peradeniya it is said to have a more prostrate habit than *S. gracilis.*

Albizzia odoratissima.—A very popular shade tree in many parts of India. Its growth on St. Coombs has been disappointing.

Albizzia saponaria.—An extremely slow growing species. It does not appear to be suitable for this elevation.

Albizzia sumatrana.—On St. Coombs the growth and type of shade given by this tree appear to be ideal for tea. In some areas in Uva growth has been so rapid that the trees have been found to be competing unduly with the tea for plant food. Accordingly this species is not suitable for areas where conditions are such as to encourage too rapid growth.

Weedkillers.—Experiments with weed killers continued. "Borascu 44", a sodium borate dust, is a non-selective weedkiller which acts through the roots and which is supposed to have considerable residual effect. It was, therefore, thought that it might prove of use in keeping roads and paths clear of weeds. The results of trials of Borascu 44 on paths having an average growth of couch (*Panicum repens*) are given in table 6.

Table 6. *Effect of Borascu* 44 *on couch* (*Panicum repens*).

Amount applied per acre	Results
2904 lbs.	Slight scorching of top growth. Patches appeared to be killed but fresh growth observed after two months.
3872 lbs.	Scorched top growth. Couch appeared to be dead but fresh growth observed after about two months.
4840 lbs.	Scorched top growth. Couch appeared to be dead, but fresh growth observed after about two months.

As even 2 tons per acre failed to effect a complete kill, it is clear that Borascu 44 is quite useless for the control of couch. Furthermore its price is in the neighbourhood of Rs. 50/- per cwt.

Trials were also carried out with the object of controlling ribbon grass (*Phalaris arundinacea*) growing in ravines on an estate in the Pundaloya district. The treatments used, all of which resulted in a complete kill, together with the application rates required, are given in table 7.

Table 7. *Effect of weedkillers on ribbon grass (Phalaris arundinacea).*

Weedkiller and concentration (Lbs. or Gls. per acre)	Method of application	Number of applications	Results
50 lbs. T.C.A. (1) + 200 gls. water + 0.5% Teepol	Sprayed at high volume	2nd application after two weeks	Complete kill
50 lbs. T.C.A. + 100 lbs. Sodium chlorate + 200 gls. water + 0.5% Teepol	ditto	One, followed by an application of 50 lbs. T.C.A. + 200 gls. water + 0.5% Teepol after two weeks	Complete kill. It is possible that the second application might be replaced by 25 lbs. T.C.A. + 25 lbs. Sodium chlorate
100 lbs. T.C.A. + 6 gls. P.C.L. (2) + 150 gls. water + 0.5% Teepol	ditto	One	Complete kill
Borascu 44 4840 lbs.	Dusted	One	Complete kill

(1) T.C.A. = Sodium trichloracetate
(2) P.C.L. = Sodium chlorate (liquid concentrate)

Treekillers.—Trials were carried out with two new treekillers, "Trioxone"—a liquid containing 2, 4, 5-trichlorophenoxyacetic acid (2, 4, 5-T) esters equivalent to 5 lbs. acid per gallon—and ammonium sulphamate. Experimental quantities of both materials were kindly supplied by Messrs. Imperial Chemical Industries (Export) Ltd.

The various methods of application tested were as follows:—

1. Pouring a solution of the chemical into a frill girdle, or into holes bored round the trunk.

2. Felling the tree and applying the solution to the cut surface of the stump. This method of use is primarily intended to prevent resprouting of the stump.

3. As a foliar spray.

From the results of the trials, summarised in table 8, it would appear that 2, 4, 5-T is an effective treekiller at much lower concentrations than is ammonium sulphamate. Gums apparently display considerable resistance to both chemicals.

Table 8. *Effect of Trioxone* (2, 4, 5-T) *and ammonium sulphamate on various trees and shrubs.*

Chemical and concentration	Quantity used	Method of application	Tree or shrub	Results
Trioxone (2, 4, 5-T) 70 ccs. in 450 ccs. diesel oil	520 ccs.	Frill girdle	*Grevillea robusta* full grown	Dead after about 6 months
ditto.	520 ccs.	8 holes drilled ½″ dia. × 2″ deep	ditto.	ditto.
ditto.	70 ccs.	3 holes drilled ½″ dia. × 2″ deep	*Erythrina lithosperma.* Girth 2′	Dead after about 3 months
ditto.	300 ccs.	ditto.	Gum—Eucalyptus sp. Medium size	No effect
ditto.	50 ccs.	2 holes drilled ½″ dia. × 2″ deep	ditto.	ditto.
ditto.	50 ccs.	Sprayed	Queen of the night. Full grown	Dead after about 3 months
Ammonium sulphamate	½ lb. + 375 ccs. water	Frill girdle	*Casuarina equisitifolia* Girth 26″	Dead after 3 months
ditto.	¾ lb. + 180 ccs. water	ditto.	*Albizzia falcata* Girth 18″	Dead after 2½ months
ditto.	½ lb. + 375 ccs. water	ditto.	*Grevillea robusta* Full grown	Dead after about 6 months
ditto.	ditto.	8 holes drilled ½″ dia. × 2″ deep	ditto.	No effect
ditto. ¾ lb. + 450 ccs. water	100 ccs.	Frill girdle	Gum—Eucalyptus medium size	ditto.
ditto.	150 ccs.	ditto.	*Erythrina lithosperma.* Girth 2′	ditto.
ditto.	50 ccs.	Stump	*Cassia didymobotrya*	Treated stump killed. Fresh growth from ground level.
ditto.	20 ccs.	ditto.	*Acacia decurrens* Girth 4″	Dead after about 2 months

Field Experiments.—None of our long term field experiments completed cycles during the year.

GUATEMALA GRASS EXPERIMENT.—Seven cuts have now been taken from this experiment and changes in the response pattern are becoming evident. In particular the response to applied potash is increasing markedly, while the response to nitrogen at the higher application rates is falling. This suggests that, after the grass has been established for a period of about two years, it has exhausted most of the extra reserves of potash in the soil which it had previously been able to secure through its exceptional foraging ability, and that it is now becoming more and more dependent upon the potash applied as fertiliser.

For established areas of Guatemala grass, therefore, it is clearly desirable that a fertiliser mixture containing a higher proportion of potash than the 6: 2: 1 mixture previously recommended be applied. The mixture now suggested as suitable for the manuring of Guatemala grass is accordingly as under:—

5 parts sulphate of ammonia

3 parts ordinary superphosphate

2 parts muriate of potash

The previous recommendations to manure about 10 days after each cut and to adjust the application rate in accordance with the rate of growth of the grass remain unchanged.

G. B. PORTSMOUTH,
Plant Physiologist.

REPORT OF THE PATHOLOGIST FOR THE YEAR 1954

General.—There were no changes in staff. Mr. C. A. Loos was awarded a scholarship, sponsored by the Food and Agricultural Organisation of the United Nations Expanded Technical Assistance Programme, for advanced studies in nematology. He proceeded on study leave on May 29th and returned to Ceylon on August 15th. The main study course was worked with Dr. Gerald Thorne, Nematologist of the United States Department of Agriculture at Salt Lake City, Utah. Visits were made also to Beltsville in Maryland, the North Carolina State College in Raleigh, the Pee Dee Experimental Station in Florence, South Carolina, and to Burley and Rupert in Idaho. During Mr. Loos's absence the Mycologist, in addition to his own duties, was in charge of all pathological work.

In conjunction with the Mycologist a combined total of 1,101 letters were received and 1,061 despatched.

29 visits were paid to estates for advisory purposes.

892 soil samples were examined and reported on for parasitic eelworms.

Mites.—Scarlet mites (*Brevipalpus spp.*) were reported as causing fairly widespread damage to tea in the Maskeliya, Dickoya and Dimbula areas. Defoliation following infestation was most severe in 3rd and 4th year fields.

Yellow mite (*Hemitarsonemus latus*) attacks were reported throughout the tea districts, especially from tea recovering from pruning, during the dry weather months. Attacks over the last few years are reported as increasing if intensity from year to year.

Acaricides.—In co-operation with manufacturing firms a number of acaricides (mite toxic chemicals) were tested both in the laboratory and in the field. Field tests included tasters' reports on the tainting properties of the formulations in the manufactured teas.

We were particularly interested in a class of acaricides which had been reported as being effective against spider mites of fruit trees. Three formulations, viz. Messrs. Boots Pure Drugs Ltd's. 'Chloricide' (p-chlorophenyl p-chlorobenzyl sulphide), Messrs. Plant Protection Ltd's. 'Ovotran' (p-chlorophenyl p-chlorobenzene sulphonate) and Messrs. Murphy Chemical Company's special 'Murvesco' fog oil (p-chlorophenyl benzene sulphonate), were tested against scarlet mite.

(1) Chlorocide.—A wettable powder, made up as a suspension of 1 pound in 40 gallons water, and applied to cut tea shoots which supported large numbers of scarlet mite eggs, inhibited hatching, or, where eggs hatched, the young larvae were killed on emergence. A 5 per cent. chlorocide dust inhibited hatching of a large percentage of eggs but had no effect on larvae which emerged after the application of dust. This formulation was not effective against yellow mite.

Chlorocide, made up as a suspension of 1 pound in 25 gallons water, and applied at about 200 gallons per acre on two occasions, at weekly intervals, had no scarlet mite.

Technically pure solid 'Chloroparacide' was dissolved in the solvent 'Sovacide' (Messrs. Vacuum Oil Co. Ltd.) to give a concentration of 1 pound of the active ingredient (chlorocide) in a gallon of mixture. This was applied over an acre of scarlet mite infested tea through Messrs. Swingfire Ltd's. 'Swingfog' machine on three occasions (3rd, 8th, and 14th April), the operator fogging bands of tea 5 rows wide. The fogging on each occasion was done at about 7 a.m. while dew was still heavy on the foliage. The areas were examined 2 weeks after the third and final fogging. On that date bushes in both fogged and unfogged plots showed equally severe infestation with mites, in all stages of development from eggs to the mature forms.

(2) Murvesco Fog Oil.—Bushes heavily infested with scarlet mite were fogged with this product through the 'Swingfog' machine. Bushes were fogged continuously for 3 minutes (a rate far in excess of recommendations), but there was no acaricidal effect nor was hatching of eggs inhibited.

(3) Ovotran.—This formulation did not make a stable suspension in water. The large particles of the formulation clogged the spraying nozzles and made application difficult. The acaricide had little effect on scarlet mite.

(4) Karathane W. D.—A concentration of ½ pound 'Karathane' (a product of Messrs. Rohm & Haas Ltd. containing 22.5 per cent. dinitro capryl phenylcrotonate) in 100 gallons water gave complete control of scarlet mite on cut shoots in the laboratory. Eggs hatched normally but the young larvae were killed on emergence.

(5) Akar 338 Emulsifiable Concentrate.—Formulated by Messrs. Geigy Insecticides, Ltd., Switzerland, as 25 per cent. chlorobenzilate. All living stages of ascrlet mite were killed with a single application of 'Akar 338' applied at a dilution of 1 part in 1000 parts of water as a soaking spray to leaves of heavily infested tea plants growing under laboratory conditions. Up to one week after application larvae from freshly hatched eggs were killed, but after a week a second application of the acaricide was necessary to kill late hatchings. This formulation is being tested in the field by the Entomologist.

Reinfestation of Tea by Scarlet Mite.—In years prior to the advent of the blister blight disease into Ceylon, most upcountry estates clean pruned their tea fields. With such a pruning all leaf pests such as mites, tortrix, etc. were completely eradicated. With the light pruning now practised a large number of leaves are left on the bush and with it there is a considerable carry over of mites into the following cycle. It seemed probable, therefore, that the increase in damage caused by scarlet mite might be attributed to this carry over of infective material. To test this hypothesis an experiment was laid down on Burnswick estate, Maskeliya.

A 13 acre field on Bloomfield division was divided into 3 blocks of approximately 5, 5, and 3 acres and the following treatments carried out:—

(1) 3 acres block clean pruned and sprayed as usual with a copper fungicide for blister blight control only.

(2) 5 acre block light pruned, leaving a large number of leaves on the bushes, and sprayed with a copper fungicide.

(3) 5 acre block light pruned, leaving a large number of leaves on the bushes, and sprayed with 'Sulphinette' (a solution of calcium polysulphides in water—containing 25-28 per cent. polysulphide sulphur).

The spray was made up at a dilution of 1 gallon in 40 gallons water, and applied at weekly intervals from 2 weeks after pruning until 4 weeks prior to tipping. The first four applications were in the region of 25 gallons per acre, but after that the rate was reduced to 15 gallons per acre. Sulphinette was selected in preference to any other sulphur formulation in the control of scarlet mite as it had been reported on by Dr. Pfaeltzer as a material which gave a control of blister blight of the same order as given by perenox and Shell copper fungicide. (Studies in Blister Blight Control VI. An Evaluation of some commonly available Fungicides in the Control of Blister Blight. *Tea Quarterly*, Vol. XXII. Pt. 2 June, 1951, pp. 52-55).

Six observations, one prior to treatment and the others at 6, 12, 18, 24, and 30 weeks after treatment commenced, were made on the plots.

Twelve weeks after the commencement of the experiment the clean pruned plots, which up to six weeks were devoid of leaf, showed a fairly heavy local build up of mites which were apparently infestations from falling grevillea leaves. Examination of fallen grevillea leaves revealed that about 20 per cent. carried the scarlet mite.

As sulphur applications are only possible when the bushes are in the recovery period from pruning and as continued infestation from grevillea leaves is possible throughout the cycle, control on tea alone during the 6 weeks of pre-plucking growth can be of limited value. The primary object of the experiment was, however, to determine whether clean pruning and/or sulphur applications for the post pruning to prior tipping period would be of advantage in scarlet mite control during the whole plucking cycle of 3-4 years. Under the conditions of the experiments these treatments appear to have been of little value.

Albizzia Mite.—In my annual report for the year 1953 (*Tea Research Institute Bul. No.* 35) I referred to the scarlet mite, *Brevipalpus phoenicis* (Geijskes) on *Albizzia falcata* syn. *moluccana* in the Masekliya district. The albizzia branches showed rosetting of young growth which was accompanied by a leaf-fall from mature branches. The mite was found in large numbers at the base of the rosetted shoots and along the leaf stalks. Very few mites were found on the leaves. In 1954 a further consignment of specimens was collected from albizzias in Maskeliya and Dimbula and these, together with scarlet mite infested leaves from Maskeliya and Dimbula, were sent to Dr. Earl Prichard, Associate Professor of Entomology, University of California, U.S.A., who very kindly identified the specimens as follows:—

Tea—Dimbula district—*Brevipalpus australis.*
Tea—Maskeliya „ —*B. phoenicis* and *B. inornatus.*
Albizzia—Maskeliya district *B. phoenicis.*
Albizzia—Dimbula „ *B. phoenicis.*
Grevillea—Dimbula „ *B. phoenicis*

From the above identifications it would appear that both *B. australis* and *B. phoenicis* can cause severe attacks on tea. *B. inornatus* is probably capable of damage too. So far as I am aware the scarlet mite *B. phoenicis*, which is apparently the common scarlet mite on grevilleas and therefore probably the mite responsible for the severe attacks on tea in Maskeliya, has not previously been recorded from Asia.

The attacks on albizzias on an estate in Maskeliya were so severe that a small scale spray control trial was initiated. Five alternate rows of albizzias, each row containing 10 trees, were marked out for the experiment. The trees were 10-20 feet high and planted 20 feet apart. All the trees in the experimental blocks showed damage due to mite infestation and the branches carried the mite in all stages of development. Each row of 10 plants received a different treatment. The treatments were as follows:—

(1) Trees 1-10 sprayed with equal parts of sulphinette (at a dilution of 1 gallon in 40 gallons of water) and spersul wettable powder (at a concentration of 1 pound in 25 gallons water). The mixture was applied as a foliar and young stem spray.

(2) Trees 11-20 'Systox' (systemic insecticide—trialkyl thiophosphate) applied as a 0.10 per cent. solution on to the main stem as a soaking spray.

(3) Trees 21-30. Ovotran wettable powder (50 per cent. active ingredient) applied as a foliar and young stem spray at a concentration of one pound Ovotran in 25 gallons water.

(4) Trees 31-40. Albolineum (an emulsion containing 80 per cent. refined mineral oil) applied, as a foliar and young stem spray, at a dilution of 1 gallon albolineum in 50 gallons water.

(5) Trees 41-50. Unprotected.

Two spray applications were made, the second application being 2 weeks after the first. Prior to the first application two trees in each treatment were examined for mites. Mites in all stages of development were observed. At that time there was considerable evidence of new growth and the trees looked in a slightly better condition than one month previously. On the date of the 2nd spraying a considerable amount of new growth had developed in all treatments. Five weeks after the second application of the acaricides a complete examination was made on trees in all treatments. At that time the trees, including those in the unprotected area, showed good general recovery and very little evidence of rosetting and defoliation. Mites were few in number on trees sprayed with ovotran and sulphur (sulphinette+spersul). Trees in the systox, albolineum and unprotected areas showed large number of mites on young growth. At the final examination $2\frac{1}{2}$ months after treatment the growth on all trees was excellent. There was no evidence of die-back or rosetting, and all trees were in full leaf. On examination the unprotected, albolineum and systox treatments showed a lightly higher mite infestation than the sulphur and ovotran treatments. Although sulphur and ovotran caused a marked decrease of the scarlet mite *Brevipalpus phoenicis* following 2 applications at fortnightly intervals weather conditions were apparently the chief controlling factor in the recovery of the plants.

C. A. LOOS,
Pathologist.

REPORT OF THE MYCOLOGIST FOR THE YEAR 1954

General.—There were no staff changes during 1954. During the absence of the Pathologist from June to August his duties were carried out by the Mycologist. For easy reference details of much of the entomological work carried out by the Mycologist have, however, been included in the Pathologist's report.

421 consignments of diseased material were received for examination and report. 36 estate visits were made by the Mycologist, and three by the Technical Assistant. Two addresses were given to District Planters' Association meetings.

There were no reports of serious outbreaks of known diseases during the year. Both the number of cases of *Poria* root disease received, and field reports on this disease, showed a considerable decline over recent years, probably indicating that increased attention is being paid to early control measures.

Blister Blight.—Blister blight was rather more severe than in recent years, as a result of the long dull periods during the south west monsoon. This was particularly noticeable in the low-country, where the customary bright periods during the monsoon were less frequent than usual.

(1) St. Coombs No. 8 Field Experiment.—The unsprayed area of this field (Block A), which suffered a severe setback following pruning in July 1953 (the first time that this field has been pruned during the monsoon since the commencement of the experiment), did not come into plucking until February, 1954. The remainder of the field was in plucking in October/November 1953, and was yielding well by the beginning of the year.

Yield figures for 1954, expressed as pounds made tea per acre, are given in Table 1, from which it will be seen that spray protection during both monsoons has given a 62 per cent. increase in crop over the unprotected control and protection only during the south west monsoon as increase of 46 per cent. It is interesting to note that the unsprayed block, despite its bad start, gave 855 pounds made tea per acre for the eleven months it was in plucking. This may be accounted for to some extent by the fact that the whole field is manured at the level of the highest yielding plot *i.e.* for approximately 1,500 pounds per acre.

Table 1. *No. 8 field experiment. Yield records*, 1954

Block	Treatment	Yield, lbs/acre	Increase over control, lbs/acre
A	Control, unsprayed	855	—
B	Sprayed both monsoons	1,387	532
C	Sprayed S. W. monsoon only	1,245	390

(2) Spraying and dusting equipment.—Following the widespread use of the Spraying Systems Inc. 'Boomjet' nozzle, number OCO2, spraying output per labourer has been increased to a figure of $3\frac{1}{2}$-4 acres per man per day. On easy terrain some estates claim an output of up to 6 acres per man per day. There were a number of complaints of failure to achieve satisfactory protection when using this nozzle, which when investigated were all found to result from the same cause, *i.e.* the application of a reduced gallonage of spray per acre when using the nozzle to spray four rows at a time. Outputs as low as 11 gallons per acre were recorded, and it was found that the fungicide was still being mixed at the old (single nozzle) rate of 4 ozs. per 10 gallons. Thus, insufficient fungicide was being applied per acre, and it was recommended that an output trial should first be conducted, followed subsequently by general mixing of 6 ozs. of fungicide in the gallonage of water put out per acre.

A prototype hand-dusting machine, produced by the Kestrel Engineering Company, was tried out early in the year and found to compare favourably with other machines in general use. The principal advantage with this machine is that weight is well distributed, the hopper being carried on the operator's back.

(3) Fungicides.—No fungicide trials were conducted by the Mycologist during 1954, but a spraying trial on 50 per cent. copper fungicides, laid out by Messrs. Baur & Co. on Clarendon Estate, Nanu Oya, was overlooked and assessed.

Five treatments were included in the trial, assessment being made on the normal numerical scale of 0-6. Results are given in Table 2.

Table 2. *Spraying trial on Clarendon Estate.*

Treatment	Mean assessment figure for season	Degree of protection
A. Sandoz 53	0.40	Good
B. Sandoz ordinary	0.55	Satisfactory
C. Geigy 50	3.35	Nil
D. Cuprokylt (as standard)	0.45	Good
E. Control, unprotected	3.65	Nil

It will be seen that good protection was gained with both the new Sandoz product, 'Copper Sandoz 53', and with Cuprokylt (Messrs. Universal Crop Protection Ltd.), whilst the other new product, 'Geigy 50', gave virtually no protection.

(4) Resistance to Blister Blight.—An attempt was made during the year to examine the possibility of resistance to blister blight being a rootstock characteristic. Clone 2024 was chosen as the stock and during February and March 60 patch grafts were made, using budwood from the susceptible clone No. 1294, and from susceptible bushes in the field. Only 10 per cent. of the grafts were successful, all these being with clone 1294 budwood. The remainder were either incompatible, or, owing to the very high rate of callussing of clone 2024, the "window" became completely callussed over before the graft

had taken. All of the six 1294 scions which were successful carried numerous blisters by July, whilst the stocks remained uninfected. It is obvious that any further work along these lines will have to be on a much larger scale, and include very many more clones.

Rhizoctonia Disease.—The low-country experiment on the disease said to be caused by *Rhizoctonia solani* was terminated on the area being pruned in October 1954, six months before completion of the proposed three year cycle. Results were disappointing, no significant differences between treatments being recorded. Isolations from diseased leaves throughout the course of the experiment failed to indicate the presence of *Rhizoctonia* in any of the lesions examined. Inoculations onto young plants, using various isolated fungi, and diseased tissues, failed to establish the presence of any pathogen, other than those already known to be present, *i.e.* the causative organisms of brown and grey blights, red rust, and thread-blight. Further investigation into the pathogenicity of these organisms is planned.

Suggestions that the observed defoliation, ascribed to *Rhizoctonia*, may be due in some degree to shot-hole borer infestation are being investigated. Preliminary results indicate that up to 80 per cent. of the water conducting tissues of shot-hole borer infested shoots, may be interrupted at some point in the length of the shoot.

Other Investigations.—(1) Two previously unrecorded conditions have been under investigation during the year. The first is characterised by root lesions of a type not previously recorded on tea, and would appear to be limited to bushes already infected by the phloem necrosis virus. Spread is rapid, quite large patches of bushes having died. Isolations from the lesions have failed to date to produce any pathogenic organism.

The second is characterised by a peculiar stunting of new growth following pruning. The new buds fail to expand, merely producing rosettes of clustered buds which produce series of scale leaves. Four estates have reported this condition which is of sporadic occurrence and does not appear to be infectious. An apparently identical condition was reported on tea in East Africa in the Annual Report of the Tea Reserach Institute of East Africa for 1952, when the suggestion was made that a virus might be responsible. Investigation of both these conditions is continuing.

(2) Mycorrhiza.—The large-scale pot experiment on the tea endophyte completed one year of treatments in November, and examination of roots and soil samples has been commenced. No results are available as yet.

Examination of roots of clonal plants from two estates, suggests that high mycorrhizal density may be correlated not only with lower yield potential, but also with good rooting ability of the cuttings.

(3) Die back in the low-country.—Preliminary investigations into the problem of die back of shoots in the second year of the cycle have indicated that the interrruption of water uptake by shot hole borer galleries, (already referred to as being possibly responsible for defoliation), may also be responsible for some degree of die back, particularly during periods of drought. The investigation is to continue, with potometric determinations being correlated with density of shot-hole borer galleries. The examination of wood-rots, associated with branch breakage from shot-hole borer attack, will be included in the investigation.

(4) Phloem necrosis.—An area of half an acre on Eskdale Estate, Kandapola, in the centre of an area of tea heavily infected with the phloem-necrosis virus, was planted up with selected clonal material to be used for further investigations into the phloem-necrosis disease. Acknowledgment is made to the Standard Tea Co. Ltd. for placing this land at our disposal.

(5) Insecticide and fungicide taint trials.—Trials were carried out during the year on the following products, with the results indicated in Table 3.

Table 3. *Insecticide and fungicide taint trials.*

Product	At first plucking after application	At second plucking after application
T. 120 sulphur emulsion	Heavy taint	Slight taint
Duphar lindane	Tainted	Satisfactory
F.W. 293 acaricide emulsion	Suspicious	,,
F.W. 293 dispersible powder	,,	,,
Karathane	,,	,,
Chlorobenzilate	Satisfactory	,,
Dieldrex 15	,,	,,
Chlorodox	,,	,,
C.A.A. experimental fungicide	,,	,,

(6) Fungus flora of tea soils.—An investigation into the distribution and activities of soil fungi in tea soils was initiated. This investigation is to be conducted in conjunction with the soil survey being carried out by the Agricultural Chemist.

B. N. WEBSTER,
Mycologist.

REPORT OF THE OFFICER-IN-CHARGE PASSARA SUB-STATION FOR THE YEAR 1954

General.—Mr. R. Alfanso was appointed Field Attendant on 3rd February in succession to Mr. C. Marudaveeran who resigned his post in December, 1953.

Close on 1,900 letters were dealt with during the year. 883 were received and 1,013 despatched. This is in addition to the large number of requests for information and advice on various subjects which are received over the telephone.

The number of consignments of specimens received for examination and report was a little over a 100. Besides insect pests and diseases of tea, green manures, cover crops and shade trees, these consignments included samples of soil for pH determination.

All soil samples accompanied by requests for information relating to eel-worms were forwarded to St. Coombs for disposal.

A large number of weeds and green manures were received for identification.

"Nettle Grub and its Control" was the subject of an address to the Passara District Planters' Association in January by the Officer-in-Charge of the sub-station.

Demonstrations.—Two demonstrations were arranged during the year. The first took place at Badulla when technical officers from four Colombo firms demonstrated and explained the working of the latest spraying and dusting equipment of which their firms are local agents. The demonstration took place in the grounds of the Uva Club following the Annual General Meeting of the Uva Planters' Association and was well attended.

The second was a talk *cum* demonstration on tea manufacture and was held at two centres; at Ury Group factory for those in the Passara, Madulsima, Lunugala and Namunukula districts, and at the Demodera Group factory for the Badulla, Bandarawela and Haputale districts. Mr. Keegel, the Technologist at St. Coombs, came down specially for these talks which were greatly appreciated by the large attendance at both centres.

Nettle Grub.—18 estates from Uva reported the pest to the Passara sub-station during the year. The affected estates were distributed as follows:—six estates in Namunukula district, four each from Badulla and Passara, three from Haputale and one from Lunugala.

With the exception of one estate in the Namunukula area which had its outbreak confined to the blue-striped nettle grub, *Parasa lepida*, all the remaining estates were attacked by the fringed nettle grub, *Natada nararia*.

Some of the outbreaks were serious and caused a considerable amount of defoliation. Only 8 estates, however, found it necessary to resort to artificial control. While four estates sprayed with either soap solutions, or DDT, 4 estates concentrated on collection and destruction of cocoons. All the remaining estates were quite content to allow natural agencies, "wilt" disease and hymenopterous parasites like *Fornicia ceylonica* and *Rogas* sp. (*Braconidae*) and *Euplectrini* (*Chalcididae*) to effect the usual control.

Shot-hole Borer.—The experiments commenced at Galbode in 1953 were continued, but still no important conclusions can be drawn. In experiment No. 1, laid down to determine loss of crop due to shot-hole borer, no damage was caused in the treated plots as against a slight damage in the control plots. A serious attack of tea tortrix, however, occurred in this field in August and persisted for the rest of the year. It was more severe in the treated plots. In consequence the total yield obtained from the control plots, not protected from shot-hole borer, was higher than the total yield from the treated plots. This attack indicated the risk of new pest outbreaks by destruction of beneficial parasites.

In experiment No. 2 no appreciable borer damage was found in fields treated with dieldrex at the 6 week and 12 week interval, but the 18 week interval treatment was severely attacked. This was, however, largely due to the latter block being situated in a very severely infested portion of the field and comparisons are not, therefore, strictly justifiable. The strength of the dieldrex spray used in both these experiments was very low, being 1 in 800 dilution.

Branch breakage as a result of shot-hole borer attack was also noted in these experiments and on two occasions all broken branches were collected and carefully examined for evidence of damage by shot-hole borer. The results of these examinations showed an absence of breakages due to shot-hole borer in all treated plots of experiment No. 1, as against 61 in the control plots which were not sprayed. The percentage of broken branches was, however, very low being less than 2 per cent. In experiment No. 2 the number of broken branches in the 6 week and 12 week interval sprayed plots was 10 and 36 respectively, as opposed to 412 in the plot receiving an 18 week interval treatment.

In addition to the two experiments on Galbode Estate, Ratnapura, a field experiment was initiated on Gonakelle Estate, Passara, towards the latter half of 1954. The chief aim of the experiment was to ascertain the efficacy of three sprays and a dust when applied only once to a field in plucking. A field 18 months from pruning was selected. The treatments were as follows:—

(1) Dieldrex 15 as a 1 per cent. spray.

(2) Dieldrin 2 per cent.

(3) Limbux lime at a concentration of 1 cwt. of the lime in 100 gallons water.

(4) Limbux lime and dieldrex 15—1 per cent. spray.

(5) Control.

The application of sprays and dusts in the tea 18 months from pruning was found extremely difficult. Since it was essential that the sprays and dusts should settle on the branches for their residual effects to be gauged, it was found necessary to thin out the foliage at the bottom of the bush.

The bushes in the Passara experiment received only one application. Three examinations to assess the value of the insecticides were made at intervals of a month, so that the third examination was made 3 months after application. The examinations comprised both areas.

External examinations consisted in 18 bushes per treatment being examined for the presence of open galleries only; the same bushes being examined on each of the 3 occasions. For purposes of dissection another 18 bushes per treatment were selected and pruned—6 bushes on each occasion. Prunings were brought to the laboratory for dissection and a record made of the various types of galleries, the contents of populated galleries, etc.

The data obtained showed a very high degree of mortality for the dieldrex sprays, being 88 per cent. and 90 per cent., while the dieldrex dust gave 48 per cent. mortality. Limbux lime and control bushes had only 3 per cent. and 4 per cent. mortality respectively.

The efficacy of the sprays was also shown in the greatly reduced percentage of new galleries with the dieldrex spray applications being only 26 per cent. and 20 per cent., while the dust had a percentage of 43 per cent. and the lime and control 48 per cent. and 68 per cent. respectively.

A high degree of control may, therefore, be expected if application can be made practicable.

Red Borer.—In the examination of broken branches in experiments 1 and 2 at Galbode observations were also made of damage caused by red borer. A total of 23 branches damaged by this pest was found in the treated plots of experiment No. 1, as against only 12 in the control plots. In experiment No. 2, totals of 62 and 45 branches damaged by red borer were found in the 6 week interval, and 12 week interval treatments respectively. The percentage damage caused by red borer works out in the treated plots to 36.5 per cent. in No. 1 experiment, and 30.9 per cent. in No. 2. This supports the observation made in Ratnapura in 1952, that red borer can play a considerable part in the damage found in nurseries and new clearings which is frequently attributed to shot-hole borer. The ineffectiveness of the insecticidal applications to control red borer are also clearly indicated.

G. D. AUSTIN,
Assistant Pathologist.

REPORT OF THE SCIENTIFIC OFFICER, LOW-COUNTRY SUB-STATION, FOR THE YEAR 1954

General.—The organization and composition of the low-country sub-station remained unchanged during the year.

273 letters were received and 286 letters were despatched. During the year the notice in the *Tea Quarterly* regarding correspondence was suitably amended, and subsequently most letters concerning low-country matters were received direct, as required.

23 advisory visits were made to estates. Of the various problems on which advice was sought, those in connection with shot-hole borer and cultivation programmes were the most numerous.

7 Planters' Association meetings, and 2 Small Holders' Co-operative Society meetings were attended. Addresses were given at 4 of these meetings.

2 articles concerning low-country matters were published in the *Tea Quarterly* during the year—one reviewing the current research activities in the low-country, and the other reviewing the whole subject of starch deficiency (with particular reference to pruning). An account of the minor element experiments carried out in Java (with particular reference to magnesium deficiency) was translated.

Our thanks are again due to the management of Vogan, Ingiriya and Galbodde estates for continuing to allow us facilities for field experiments on these estates, and to Messrs. James Finlay's for continuing to loan us the services of a Field Assistant for the Galbodde experiments.

Field Experiments.—The routine upkeep of the low-country field experiments was continued under my general supervision, and 87 visits were made to these areas.

(1) V.P. Experiments, Vogan Estate.—Planting up of the 4-acre block leased to the T.R.I. was virtually completed during the year; the planting material used consisted exclusively of the 30 most promising clones in the original collection of about 200 clones.

The Sirikandura clones in the 1951 series (in effect one year older than the remainder of that series) were brought into plucking during the year. Table I gives the yields of these clones, calculated for a stand of 5,000 bushes per acre and 23 per cent. outturn, for the first year of plucking (based on the 8 months during which they were actually in plucking).

Table 1. *Sirikandura clones. Yields and blister blight incidence. First year.*

Clone No.	No. of bushes	Calculated yield lb./acre	Blister blight incidence
36	27	1,610	Nil
220	58	1,691	Severe
215	151	2,340	Severe
123	111	2,737	Severe
106	130	2,898	Nil

By way of amplifying the remarks made on the incidence of blister blight on these clones, it should be noted that quite a severe attack of blister blight was experienced in the Kalutara district during the N.E. monsoon; this indicates that blister blight is undoubtedly on the increase in the low-country even in districts far distant from the main sources of infection.

V.P. nursery shading.—Experiments with coir matting (in strips 6 feet wide) as shade for V.P. nurseries proved highly successful, and comparative tests (under coir matting and fern) showed that the coir matting not only produces a much higher percentage of success, but quicker and more regular growth. Of the three meshes under trial (1/8", 1/4" and 3/8") and 1/4" mesh appears to be the one best suited to low-country conditions, though it did not prove feasible to tighten the specification of the various meshes under trial sufficiently for really accurate experiments. There is little to choose between the machine spun and the hand spun yarn, but the latter is naturally far more variable in thickness; of the various types of machine spun yarn available, that designated "M.T.3" appears to be the most suitable.

Observations were made on several low-country estates regarding the success of otherwise of up-country clones grown under low-country conditions; of these Nos. 25, 2023, 2024 and 2026 are sufficiently outstanding to warrant being definitely recommended.

In nearly every case where rooted plants were transferred from up-country nurseries, they turned out to be almost complete failures; it is therefore essential (both from the point of view of acclimatisation and for other reasons) that only fresh cuttings should be used when transferring clones to low-country nurseries. The polythene bags recommended for this purpose proved perfectly satisfactory for low-country conditions, and V.P. material packed in these was kept fresh for ten days at Pembroke.

(2) Pruning cycle cum "Rhizoctonia control" experiment, Ingiriya Estate—By the end of the year this experiment had run 2½ years, and some interesting preliminary indications regarding the various cycle lengths were evident. Amongst these might be mentioned the marked falling off in yields of the 2½ and 3-year cycle plots after about 24 months (following severe die-back), and the phenominally rapid rise in yields in the case of the 18-month plots in the early stages of their second cycle. At the end of the year the 18 month cycle plots were 170 lb. ahead of their nearest rivals, in spite of having been out of plucking for 4½ months following pruning into the dry weather.

Observations made during the year showed beyond all reasonable doubt that the principal—if not the only—cause of the die-back referred to, which was very prevalent from about 24 months onwards, was shot-hole borer. Thus the experimental data so far obtained tends to support the view that in areas where die-back associated with shot-hole borer occurs on a scale sufficient to cause loss of crop during the second (and third) year of the cycle, an 18 month cycle has certain advantages. This remark should be coupled with the observation that on some other estates the die-back (and consequent loss of crop) is not only far more severe, but often occurs at an earlier stage in the cycle; consequently the fall in yields which is noticeable on the experimental plots from about the 24th month onwards does not provide any indication of the far greater loss in crop which may be anticipated on some estates from as early as the 15th month onwards.

Regarding the disease symptoms previously attributed to *Rhizoctonia* (characterized by defoliation of old maintenance leaves particularly during the monsoon towards the end of the second year in the cycle) various infection trials on nursery plants were carried out in close co-operation with the Mycologist; reference should be made to his report for the results of these, together with the results to date of the effect of the *Rhizoctonia* control measures superimposed on half the plots.

Apart from these experiments, the leaf disease under review—and its possible effect on yields—was kept under close observation. In this connection it should be recorded that for comparative purposes an examination was made of the current yields on a field on a nearby estate where conditions were identical except that there was practically no die-back. Since no corresponding fall in yields occurred when the normal 24 month cycle was prolonged, it was evident that the loss of crop which occurred on the experimental plots following severe die-back could be attributed almost entirely to the die-back, and not to the leaf-fall. Further the leaf-fall under review is clearly a separate problem to die-back, though it so happens that on the experimental plots the die-back was probably a contributory factor to the leaf-fall.

Although the general inference from these observations is that yields are not seriously affected by this leaf-fall, the fact that a large proportion of the old maintenance leaves may defoliate is, of course, of particular significance at pruning; it is therefore all the more essential under these conditions that adequate rim lungs should be left.

(3) Rhizoctonia control experiment, Galbodde Estate, and (4) Shot-hole borer experiment, Galbodde Estate:—These experiments were regularly visited by me during the year; a progress report on each was published in the September, 1954, number of the *Tea Quarterly*. For the purposes of this report, however, further reference to these experiments is being left to the Mycologist and Assistant Pathologist respectively.

(5) Shade experiments, Galbodde Estate—These experiments, which involve comparing the long term effects of *Albizzia moluccana* (under varying rotations) with *Grevillea*, were still in their initial stages.

(6) Other small scale field trials.—(*a*) *Guatemala grass thatch.*—Close observations showed that, under low-country conditions, quite a good cover of Guatemala grass thatch can be maintained for 4-5 months, varying, of course, with the thickness at which it is used. Incidence of white ants did not increase noticeably, but, in view of this possiblity in some areas, it would be as well not to apply Guatemala grass indiscriminately where seed-at-stake is used.

(*b*) *Red ants.*—Comparative tests were carried out on the effectiveness of Flit, 5 per cent. D.D.T. and 2½ per cent. Aldrin dust in the control of red ants. Of these insecticides, flit was by far the most effective, giving a quick kill as compared to prolonged "unpleasantness" sufficient merely to cause the nests to be evacuated.

(*c*) In co-operation with the Technologist, an attempt was made to further the research so far carried out regarding the effect of shade on the quality of tea in the low-country, but owing to various difficulties this had to be abandoned. An experiment along these lines in 1953 on a mid-country estate (2,000 ft.) had indicated that, in the case of a light pluck, prices for leaf growing under heavy shade were between 8 and 14 cents higher than the corresponding grades from "no shade" areas; in the case of a coarse pluck, the corresponding figures were 1-6 cents higher.

Miscellaneous Observations.—(1) Pruning cycles.—A fairly comprehensive study was made on the question of low-country pruning cycles by means of close observations on a number of fields on several estates. In general these showed that there is a case for far greater variations in cycle lengths than is the current practice and that the 2-year cycle is by no means the best for all conditions in the low-country. Conditions favouring an 18-month cycle have already been discussed, while in areas where no die-back associated with shot-hole borer occurs, there is ample evidence that healthy, vigorously growing tea can run 30 or even 36 months in the low-country without an appreciable decline in yields from the cycle average; this applies particularly to young tea and high yielding tea, and is irrespective of the incidence of the leaf-fall which is universal in the low-country towards the end of the second year in the cycle onwards.

(2) Pests and diseases.—Shot-hole continued to be by far the most serious pest in the low-country, and indications are that it is undoubtedly on the increase. Serious die-back accompanied by sun-scorch was observed on several estates during the dry weather months in the second year of the cycle; these symptoms were particularly severe in the Ratnapura and K.V. districts, and were attributed by me to shot-hole borer.

The only new disease reported during the year was one which caused defoliation and die-back on *Albizzia moluccana*. This was found in association with stem cankers and (occasionally) "witches broom" effects. This defoliation should not, of course, be confused with the defoliation which commonly occurs on albizzias at certain seasons of the year following attack by caterpillars.

T. E. WALTER,
Scientific Officer,
Low-country Sub-Station.

REPORT OF THE ENGINEER FOR THE YEAR 1954

General.—Mr. J. Landreth resigned his post as Engineer and left Ceylon at the end of October. Mr. D. V. W. Perera was appointed Maintenance Engineer, and assumed duty on October 11th.

A mechanic was engaged during the latter part of the year.

Buildings, Fixed Plant, and Machinery.—The usual maintenance work was carried out on the Institute's and Estate's buildings and machinery.

(1) Quarters.—Extensions to two junior staff bungalows were completed, and a new block of quarters was built for two servants. At the end of the year quarters were under construction to accommodate 30 labourers. The cadday was completely renovated.

(2) Factory.—A leaf elevator was constructed to carry green leaf to the lofts, and a tea chest hoist was installed in the packing room to facilitate transport of tea chests.

The ground floor ceiling was painted according to a colour scheme designed by Imperial Chemical Industries, Ltd.

Individual diesel fuel tanks for the driers were installed in the furnace room. An oil flow meter was fitted to measure the flow of oil from the main tanks, and this now provides an accurate record of oil consumption.

(3) Workshop.—An electric arc welding set was purchased and installed. This has reduced both the time and cost of much of the repair work. Dexion steel shelves were fitted for storing oil and paint.

(4) Garage.—The maintenance and servicing of the Institute's vehicles was carried out in the garage.

(5) Electricity supply.—The general maintenance of all electrical equipment was carried out. Ten street lights were provided on the main road. The motor garage was wired in conduit. New wiring was put into the Technologist's office in the factory in accordance with fire insurance regulations. A 3 phase 4 wire O.T. line to the experimental withering unit was erected, and 6 motors in this plant were wired up.

(6) Water supply.—Maintenance work on the filtration plant and the dam site was carried out.

(7) Experimental machinery.—A miniature roller was constructed for clonal manufacture. This roller was fully described in the *Tea Quarterly* (Vol. XXV, Part III, September 1954). More of these rollers are being made, and are being set up in batteries of four, mounted on a steel table, and driven by a 2 h.p. motor through gearing and individual clutches.

An experimental drying oven was made, to be used at Endane Estate, where a fertiliser experiment is being established.

A large experimental unit for withering with conditioned air was constructed on the ground floor of the factory to plans provided by the Colombo Commercial Company.

Crop Protection.—No new machines were tested during the year, but repairs to several types of sprayers and dusters were carried out.

D. V. W. PERERA,
Maintenance Engineer.

REPORT OF THE OFFICER-IN-CHARGE SMALL HOLDINGS ADVISORY SERVICE FOR THE YEAR 1954

General.—During the year steady progress was made. The demands on the Service are steadily increasing, and to meet these a further five Tea Instructors were recruited in November. The staff is now as follows:—

1 Officer-in-charge
4 Small holdings Officers
15 Tea Instructors
1 Instructor cum Cinema Operator

Advisory.—The volume of correspondence and the number of visits made by officers, as shown below for the last three years, reflect the growing popularity of the Service.

		1954	1953	1952
Letters received	...	8,940	7,483	1,465
Letters despatched	...	11,438	10,277	2,452
Visits made	...	11,126	9,428	6,406

Propaganda.—(1) DEMONSTRATION PLOTS.—Free issues of manure and tea seed were again made to those keen smallholders who maintained their holdings as demonstration plots. These issues were smaller than in past years and amounted to 11 cwt. manure and 1½ maunds of tea seed.

(2) LOANS.—Loans were greatly reduced in 1954 owing to the establishment of co-operative societies which now administer a Government scheme of assistance on a much larger scale than it would be possible for the Small Holdings Advisory Service to undertake. Loans were made for the purchase of 68 tons of manure and 151 maunds of tea seed. Most of this seed was sold through co-operative societies.

(3) FIELD DAYS.—11 field days were organised in 1954, at which various types of planting material, new spraying equipment, fungicides, artificial manures and other items of interest were exhibited, and their use demonstrated and explained.

(4) CINEMA UNIT.—The United Kingdom and United States Embassies, and the Government Information Department again loaned films of educational value. During the year the following shows have been given:—

Central Province	...	36
Southern Province	...	15
Sabaragamuwa Province	...	21
Total	...	72

It is hoped that a film on the cultivation of tea, and film strips on various aspects of planting will shortly be available.

Co-operative Societies.—During 1954 nine co-operative societies were established by the Tea Advisory Board, which controls on behalf of Government the activities of the societies. The membership of these societies at the end of 1954 was 2,135, and the acreage covered by them 8,739 acres. They were situated as follows:—

Kandy District	...	5
Galle District	...	2
Kotmale District	...	1
Balangoda District	...	1

The policy of the Tea Advisory Board is for each society to cover 750 acres as a start, and to expand to approximately 1,500 acres within a radius small enough for the unit to be self-sufficient with its own manufacturing centre.

During 1954 the societies issued 504 tons of manure to smallholders at a subsidised rate, and made cash grants of Rs. 9,962 for soil conservation measures, the grants being at the rate of Rs. 20 per acre.

The Baddegama Society embarked on the collection and manufacture of members' green leaf, and this has resulted in good prices being obtained by members for their leaf. Other societies in the Central Province are also preparing to carry out the manufacture of members' leaf.

The demand for assistance through co-operative societies is growing very rapidly, and the existing societies have made a most successful beginning. Further expansion must go hand in hand with training of staff, of which there is at present a shortage. The officers of the Small Holdings Advisory Service are working very closely with the officers of the co-operative societies in the development of this co-operative movement.

Acknowledgments.—The continued help and co-operation received from the Embassies of the United Kingdom and United States, and from the Government Information Department, in connection with the supply of films, is gratefully acknowledged.

R. L. ILLANKOON,
Officer-in-Charge.

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The Tea Research Institute of Ceylon

The Smallholdings Advisory Service

Staff at December, 31st 1954

Officer-in-Charge	...	R. L. Illankoon
Tea Smallholdings Officers	...	W. T. Fonseka, K. P. Abeywickrema, M. V. de Silva and K. de A. Kulasekera
Tea Instructors	...	S. Abeywickrema, D. J. Kulatunge, G. A. Mendis, P. T. Navaratne, C. E. Sooriyaaratchchi, D. Nillegoda, K. A. Perera, T. B. Ratnayake, G. A. de Silva, B. Weeratunge, A. M. R. Illawatura, P. H. Jayasinghe, P. B. Kappagoda, R. L. Weerasekara, L. U. Weerasinghe
Office Assistant	...	N. H. Liyanage
Cinema Operator	...	L. Vincent

NOTE

The Laboratories of the Institute are situated at St. Coombs Estate, Talawakelle, and letters and enquiries should be addressed to the Director, Tea Research Institute of Ceylon, St. Coombs, Talawakelle, Telegraphic Address:—Research, Talawakelle, Telephone:—Talawakelle 44 (private exchange). Replies to correspondence addressed other than "The Director" may be subject to some delay. Specimens and other consignments sent by rail should be forwarded to Talawakelle station, C/o Messrs. M. Y. Hemachandra & Co., Ltd., Forwarding Agents. Carriage should be prepaid.

The address of the Low-country Scientific Officer is T.R.I., Pembroke, Bombuwela, near Kalutara, and Low-country estates should address their letters and enquiries directly to this officer.

The address of the Officer-in-Charge of the Smallholdings Advisory Service is 140, Ambagamuwa Road, Gampola.

The Tea Research Institute of Ceylon

Board of Control at December, 31st 1954

Appointed by the Planters' Association of Ceylon.

Mr. H. S. Hurst, (Chairman)
Mr. R. C. Scott, C.B.E.
Mr. N. B. Parker

Appointed by the Agency Section, P.A. of Ceylon.

Mr. A. D. McLeod
Mr. G. K. Newton
Mr. C. D. Green

Appointed by the Low-country Products Association.

Mr. J. L. D. Pieris
Mr. B. Amarasuriya
Mr. F. Amarasuriya

Representing the Smallholders.

Mr. V. G. W. Ratnayaka, M.B.E., M.P.

Ex-officio Members.

The Hon. the Minister of Finance
The Director of Agriculture
The Chairman, Planters' Association of Ceylon
The Chairman, Agency Section, Planters' Association of Ceylon
The Tea Controller

Secretary.

Mr. J. Lamb, O.B.E., Director, T.R.I.

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